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FIG. 1. Deflective and disruptive patterns in the American Sparrow Hawk (*Falco sparverius*). The features mentioned in text have been emphasized intentionally by the illustrator.

PROTECTIVE COLORATION IN THE AMERICAN SPARROW HAWK

BY WILLIAM M. CLAY

THE adaptive features of the color pattern of the Sparrow Hawk (*Falco sparverius*) are remarkable enough to warrant discussion. Since captive individuals have commonly been available for close and prolonged observation, it is surprising that attention appears not to have been directed at least to the most notable feature, a pair of ocelli or "false eyes" on the back of the head and neck. In study skins, however, these ocelli often are obscured by increased overlap of the feathers in the straightened and somewhat shortened neck. Some well-known paintings show the ocelli and other color-pattern features described below (see Fuertes *in* Eaton, 1914, pl. 52; Brooks *in* Roberts, 1932, pl. 19, and *in* Dawson, 1923:1640).

The Sparrow Hawk plumage illustrates the principles of countershading, disruptive coloration, and deflective or parasematic coloration. Furthermore, there is the possibility, or even likelihood, that some of the markings may be useful in intraspecific or social control, as in sex recognition or in territorial defense.

Countershading (obliterative shading) is so common among birds that it merits but brief mention here. The principle was alluded to by Poulton (1890:37–38) in describing the resemblance between a butterfly (*Apatura iris*) pupa and a leaf, but the concept generally is associated with A. H. Thayer (1896a, 1896b, 1898) by whom it was more fully developed. Thayer's statement of the principle follows: "The newly-discovered law may be stated thus: Animals are painted by nature darkest on those parts which tend to be most lighted by the sky's light, and vice versa" (1896a:124 and 1898: 477). The principle is discussed further by G. H. Thayer (1909:25) and by Cott (1940:35–46). It is an optical or psychological law, that recognition of an object is hindered when the pigmentation of the more brightly illuminated (upper) surface is so intensified in relation to the shaded (lower) surface that the two appear of equal density to an observer. Thus the effect of relief is destroyed and the object appears as a single plane. When the Sparrow Hawk is observed from a moderate distance its lesser markings, such as the streaks of the lower side, are not discernible and the general effect is that described above.

The second principle, that of disruptive coloration, is also common among birds, fishes, insects, and various other animals. It is discussed by G. H. Thayer (*op. cit.*:77) under the terms "secant" and "ruptive," and by Cott (*op. cit.*:47) who used the term "disruptive." This principle, commonly employed in camouflage, is that perception of the true outline or form of an

object is hindered by the presence of conspicuous markings which, although readily visible, bear no likeness to the true shape of the object. In some instances the eye may be concealed by a prominent stripe crossing it. One of the vertical bars on the Sparrow Hawk's head is effective in this way (Fig. 1a), illustrating disruptive coloration in the violent form designated by Cott (*op. cit.*: 51) as "maximum disruptive contrast." This type of concealment of the eye is common among predatory birds and mammals (G. H. Thayer, *op. cit.*: 81).

Deflective or parasematic coloration, the third and most remarkable type displayed by the Sparrow Hawk, was described by Poulton (*op. cit.*:207–208), who used as an example a hair-streak butterfly (*Thecla*) which misrepresents its posture by false eyes and antennae at the posterior end. Cott (*op. cit.*: 372) defined deflective coloration as "characters which misdirect the attack of enemies by misrepresenting the posture of their prey," and as patterns which "produce the impression of a head at the wrong end."

The orientation of the Sparrow Hawk's head is misrepresented by markings which produce the likeness of a face on the rear of the head, or upon each side of the head, according to the position of the observer, while the true face is obscured by the disruptive bars noted above. To the rear the bird presents an owlish "face" consisting of a pair of large "eyes" or ocelli with buffy-rufous irises and black pupils, between which is a slate-colored "beak" (Fig. 1b). In the first winter plumage the feathers comprising the "iris" are more nearly white than in the adult and the "eyes" are even more realistic, a condition which may be related to the greater incompetence during the youthful and inexperienced phase of life.

Fig. 1c shows the "eyes" of each lateral face to consist of one of the false "eyes" described above and the vertical bar which runs through one true eye. The bar, curiously, looks more eye-like from a lateral position than from the front. The "beak" of the lateral face consists of another black vertical bar in the auricular region. This "face" is highly deceptive from a postero-lateral point of observation and therefore to an observer located slightly behind the bird's field of sharp vision (*vide infra*). (Cover the true beak in Allan Brooks' painting in "The Birds of Minnesota," Roberts, *loc. cit.*, or that in Fig. 1c of the present paper, for the maximum deceptive effect.)

The position of the eyes in hawks is more frontal than in most other non-strigiform birds. This lessens the total field of vision but increases the area of binocularity. In accordance with this condition, the retina of hawks has developed a second point of acute vision, a temporal fovea (Walls, 1942: 308–309, Figs. 114 and 115), which serves the binocular or anterior field, while acute vision in the monocular or antero-lateral field is obtained by the central fovea. While binocularity doubtless is advantageous, it has been ob-

tained at the sacrifice of vision in postero-lateral directions. These are clearly the axes along which the deceptive faces are presented.

Mention may be made here of the possible effect of head-bobbing, a performance which the Sparrow Hawk frequently enacts, and which would seem to counteract the effects of concealing coloration. Grinnell (1921) pointed out that stationary objects, unlike those in motion, are more readily located by an actively-moving than by a passive searcher. Calling this mechanism "the principle of rapid peering," he divided birds into two groups according to the extent of their activity when seeking food. Head-bobbing, "teetering," or other movements which alter the location of the eyes, generally help to separate planes and to improve distance judgment, as may be readily tested for both monocular and binocular vision, and it is reasonable to assume that these properties are useful to the Sparrow Hawk. While motions of the body would appear to counteract the general effects of concealing coloration, it should be noted, firstly, that deflective coloration is not essentially cryptic in function, and, secondly, that head-bobbing by the Sparrow Hawk accentuates the conspicuousness of the ocelli and enhances their resemblance to the eyes of an actively peering owl.

The role of deflective coloration in the ecology of the Sparrow Hawk must remain largely speculative until more data are obtained. The presumed function is to "mislead" an observer with respect to the true orientation of the animal. It has been shown repeatedly that birds and many other animals respond to only one or a few attributes or "sign stimuli" in some other individual, with apparent disregard of all other attributes (Tinbergen, 1948). This is indicated in the case reported by Noble (1936) of a male Flicker (*Colaptes auratus*) attacking his own mate after an artificial male-resembling "moustache" of black feathers had been glued to her head, only to accept her again after its removal. We may postulate that the false eyes of the Sparrow Hawk may induce, in some animals, the reaction for which true eyes are the usual stimulus, while the true eyes of this bird, by their concealment, may fail to evoke a response.

It is conceivable that this stimulus-response could be of benefit in capturing food and escaping attack. With respect to the former, it should be noted that the food of the Sparrow Hawk consists partly of animals of poor visual acuity. Myopic grasshoppers and small rodents probably lack the ability and the opportunity to make discriminating observations upon a plunging Sparrow Hawk! However, this sort of deception may possibly be effective in the capture of small birds.

The Sparrow Hawk has not been reported as a major item in the diet of any predator. In fact, the predatory status of this bird so limits its own abundance that for any other animal to depend heavily upon it for food would

be ecologically unsound. However, some hawks and owls do take the Sparrow Hawk at least occasionally. Bent (as cited after each species following) lists the Sparrow Hawk in the food of the Duck Hawk, *Falco peregrinus* (1938:54, 60), Red-shouldered Hawk, *Buteo lineatus* (1937:191), and Screech Owl, *Otus asio* (1938:251). Cooper's (*Accipiter cooperii*) and Sharp-shinned (*A. striatus*) hawks are reported to include "small hawks" in their food (Bent, 1937:118, 133). The Great Horned Owl (*Bubo virginianus*) probably includes Sparrow Hawks in its varied diet. Thus the Sparrow Hawk is subject to predation which, in view of its own limited numbers, may be ecologically significant.

Persecution by non-predaceous birds may also be important to this small falcon. The entire tribe of raptorial birds is subject to such harrassment and, while it may be doubted that the larger hawks and owls are seriously menaced thereby, the small Sparrow Hawk may be more vulnerable. I have watched numerous diving attacks by Robins (*Turdus migratorius*) and Blue Jays (*Cyanocitta cristata*) upon a captive Sparrow Hawk perched on a low post. Not once have I been certain that contact actually occurred, although many times the swooping bird must have missed by less than an inch. Usually the hawk turned toward the attacker and ducked at the approach. It would seem possible that in a surprise approach from the rear the instinctive behavior of the attacker would not allow actual contact with what may appear to be an owl in defensive posture.

The Sparrow Hawk is most vulnerable when it has taken another bird and is having to cope with its struggles, particularly if the victim is a nestling whose parents are aroused to fury. If the victim is large, its struggles may force the hawk to the ground in order to make the kill, which it usually does by biting the occipital region. Perhaps it is significant that in the killing and feeding posture, with bowed head, the ocelli are brought into fullest display.

The evolution of such a complex pattern of coloration by chance alone, without recourse to utility, would appear to be highly improbable. The modern genetic interpretation of evolutionary process favors the assumption that either the color pattern, or some characteristic with which it is linked, confers upon its possessors a greater ability to leave reproducing descendants. Unfortunately, it is not easy to devise experiments to test theories on coloration as an ecological factor. We do know, however, that the average or ecological longevity of animals in the wild state is much less than their potential longevity. Most wild animals die young, from starvation, disease, predation, or other causes, and many that survive leave few or no reproducing offspring. While coloration is not a direct factor in life or death, it may have a bearing upon the possessor's ability to obtain food or to escape enemies, and it may be of service in intraspecific behavior. The very multiplicity of the factors

which affect the abundance of a vertebrate species increases the likelihood that coloration is important. To paraphrase a statement by Tinbergen (1952: 5), the duty of students of coloration is to attempt to explain coloration rather than to assume that it cannot be explained.

Summary

The color pattern of the Sparrow Hawk (*Falco sparverius*) embodies principles of countershading, disruptive coloration resulting in concealment of the eye, and deflective coloration, *i. e.*, presentation of a false "face" in the rear and another in a postero-lateral position. These "misrepresentations" cover the bird's blind area, which is greater in hawks than in most birds, and conceivably are of service in deceiving prey and/or enemies.

Acknowledgment

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Literature Cited

Bent, A. C.
1937 Life histories of North American birds of prey (Part 1). *U. S. Natl. Mus. Bull.* 167.
1938 Life histories of North American birds of prey (Part 2). *Ibid.*, 170.

Cott, H. B.
1940 Adaptive coloration in animals. Oxford University Press, New York.

Dawson, W. L.
1923 The birds of California. Vol. 4. South Moulton Co., San Diego–Los Angeles–San Francisco.

Eaton, E. H.
1914 Birds of New York. *New York State Mus. Memoir,* 12, pt. 2.

Grinnell, J.
1921 The principle of rapid peering, in birds. *Univ. California Chronicle,* 23:392–396.

Noble, G. K.
1936 Courtship and sexual selection of the Flicker (*Colaptes auratus luteus*). *Auk,* 53:269–282.

Poulton, E. B.
1890 The colours of animals, their meaning and use, especially considered in the case of insects. D. Appleton, New York.

Roberts, T. S.
1932 The birds of Minnesota. Vol. 1. Univ. Minnesota Press, Minneapolis.

Thayer, A. H.
1896a The law which underlies protective coloration. *Auk,* 13:124–129.
1896b Further remarks on the law which underlies protective coloration. *Auk,* 13: 318–320.
1898 The law which underlies protective coloration. *Ann. Rep. Smithsonian Instit. to July, 1897:* 477–482. (Reprinted from *Auk,* 13:124–129, 318–320.)

THAYER, G. H.
1909 Concealing-coloration in the animal kingdom; an exposition of the laws of disguise through color and pattern: being a summary of Abbott H. Thayer's discoveries. Macmillan, New York.

TINBERGEN, N.
1948 Social releasers and the experimental method required for their study. *Wilson Bull.*, 60:6–51.
1952 "Derived" activities; their causation, biological significance, origin, and emancipation during evolution. *Quart. Rev. Biol.*, 27:1–32.

WALLS, G. L.
1942 The vertebrate eye and its adaptive radiation. *Cranbrook Instit. Sci., Bull.* 19: 1–785.

DEPARTMENT OF BIOLOGY, UNIVERSITY OF LOUISVILLE, LOUISVILLE, KENTUCKY, MAY 10, 1952

NOTES ON THE NESTING BEHAVIOR OF THE BLACKBURNIAN WARBLER

BY LOUISE DE KIRILINE LAWRENCE

A SUMMARY of data on the nesting behavior of the Blackburnian Warbler (*Dendroica fusca*) obtained from my field notes made during the years 1943 to the end of the breeding season in 1951, is herein presented. The data concern in particular 3 pairs domiciled in the same territory at Pimisi Bay, Ontario, 70°01′ W. long. and 46°16′ N. lat., in 1946, 1948 and 1950. This territory was occupied by the species in all 9 years, but since no banding was undertaken I do not know with certainty how many individuals were involved in maintaining the territorial tradition, or how many consecutive seasons any one bird lived there.

Three nests were found, Nest A in 1946, B in 1948, and C in 1950. At the 3 nests a total of nearly 6 hours was spent watching building and 17 hours and 40 minutes observing incubation activities. At Nest B the care of the young was watched during 10 hours and 48 minutes and, at Nest C, for 40 minutes on hatching day. In addition to these 34 hours of nest-watching, many hours more were spent observing the warblers in the course of my daily field work.

In the last 9 years the first appearance of the Blackburnian Warbler in this locality has ranged from May 5 to May 17, with a mean of May 12 and a median of May 13. In the years 1946 to 1950, the females were first seen on given territories 3, 9, 9, 11, and 23 days later than the males. But since 23 days is unusual, the median of 9 days later instead of the average 11 may be taken as a more nearly representative figure of the time of arrival of the females.

Habitat

Habitat requirements of the species in this area featured chiefly mature evergreens—white pine, *Pinus strobus*, white and black spruce, *Picea glauca* and *mariana*, hemlock, *Tsuga canadensis*, and red pine, *Pinus resinosa*, in that order of importance—with a few deciduous trees, such as aspens, *Populus* spp., and white birch, *Betula papyrifera*, scattered among them. Outside my study area, I found this species in climax stands of conifers with sparse or no undergrowth and with deciduous trees and bushes around only the edges. In none of these habitats were the Blackburnian Warblers established close together. Brooks (1947:293) found this warbler common in the Appalachian Mountains, not only in the coniferous stands, but on the dry chestnut-covered ridges. Kendeigh (1945a:427) found the bird "strictly confined to hemlock trees" on the Helderberg Plateau of New York, "even in woods where the

hemlock occurred singly or in small groups. . . ." Nice (1932:92) recorded a nest found at Pelham, Massachusetts, "among comparatively open, young growth. . . ."

Nest-Building

The building of Nest A began May 25 and continued for 6 days. B was started June 3 and completed in 4 days. Nest C, a second attempt after an earlier failure, was begun June 28 and completed in 3 days. This suggests that more time may be spent building early nests than later ones.

Only the females did the building at all 3 nests. At Nest C, on which I have the most complete notes, the male was very attentive on the first day. He accompanied the female closely, sang and displayed with spread tail and vibrating wings, but I saw no courtship-feeding. Once after the female left, he sat down on the nesting material deposited on the site and remained there when the female returned and stood over him a few seconds. On the second day, he was seen near the nest only once in the forenoon, when he pursued the female and effected coitus, but he failed to appear during the afternoon watch. During an hour in the morning on the third day, he paid no attention to the nest-building, but was heard singing nearby several times. At a nearly completed nest, watched for 82 minutes by Kendeigh (1945b:154) in New York State, the male once alighted close by but was chased by the female.

The energy with which the female worked at Nest C reached a peak before noon on the first day. During this watch of 1½ hours, she made 11 trips with material in the first half hour, 5 in the second, and 7 in the third, or 15.3 trips per hour. In the second half hour she rested for 8 minutes, sitting motionless on the collected nesting materials. There was a marked decline in activity both later in the day and later in the nest-building. During watches on the second day, the female made 12 trips per hour before noon and 4 in the afternoon; on the third day, she made only 3 trips per hour before noon. The data from the other nests are in agreement; at A only 3 trips per hour were made during a watch in the late afternoon on the first day and, at B, the same number per hour were made in the morning of the fourth day. Kendeigh's (1945b) record agrees with these—5.1 trips per hour, presumably before noon, on a day when "construction was nearing completion."

Nest C was built inside an "alcove" of branchlets and leaves on the horizontal branch of a white spruce, 26 feet 2 inches from the ground and 8 feet out from the trunk. Its bottom was not affixed to the branch but rested loosely upon it, half suspended and attached to 4 short and stiff twigs by means of spider silk. The silk was collected on the first day from the trunks of the trees and the branches of the bushes. The outside of the nest was made of fine, dry spruce twigs and two pieces of birch bark. Hovering or perching,

the female broke the twigs from the trees with her bill. For the most part lining was made of dead white pine needles picked, not from the ground, but from those that hung or stuck to the trees, and a few tendrils and fine, dead grasses. The nest appeared rather transparent when seen from below. The outside diameter was 3 inches, inside 1¾ inches; outside depth 1½ inches, inside 1⅛ inches. The other two nests were built in white pines; A, at an estimated height of 40 feet about 10 feet out from the trunk on a horizontal branch; B was tucked into the crotch of 3 small upright branches at a height of about 55 feet. Spider silk, collected on the first day, was also an important item on the list of materials in Nest A. Nest B was watched only on the fourth day of nest-building. Here the female was seen pulling long strands of horsehairs from a supply at my feeding station. Dragging them behind her up to her lofty home, she often had to stop and disengage them by pulling and twisting as twigs and leaves impeded her progress. Kendeigh (1945a:427) mentioned *Usnea* and other lichens in the nesting materials used by this warbler.

Incubation

Owing to the inaccessibility of the nest, I could not obtain data on the beginning of the egg-laying, clutch size, and the exact time when incubation started. In the case of Nest A, H. M. Halliday climbed to the top of the tree 2 days after building ceased and found one egg in it. Three days later the female was incubating. At B, the female began incubating 5 days after the completion of the nest, but at C the interval between nest-completion and the known start of incubation was 7 days. According to Chapman (1940:462), the Blackburnian Warbler normally lays 4 eggs in the clutch.

At all 3 nests the female alone incubated. In Table 1 the data on the incubation rhythm are presented. The long attentive period of 86 minutes at Nest C was caused by my presence and therefore is not representative. In calculating percentage of attentiveness at this nest, however, I felt that the length of this period would be adequately offset by the longer-than-usual time of inattentiveness.

The Blackburnian Warbler's incubation rhythm appears typical for a wood warbler on an open nest. Available data from a Magnolia Warbler, *Dendroica magnolia* (Doris Huestis Speirs, unpublished data), a Chestnut-sided Warbler, *Dendroica pensylvanica* (Lawrence, 1948), a Nashville Warbler, *Vermivora ruficapilla* (Lawrence, *op. cit.*, 207), and 2 forms of Central American redstarts, *Myioborus miniatus hellmayri* and *M. torquatus* (Skutch, 1945:240, 242), the last 3 nesting on the ground or in niches in banks, slopes, or among vegetation, are the basis for Table 2.

The Blackburnian female B showed a decline in the length of her periods off the nest as hatching day drew near, while her periods on remained almost

TABLE 1
INCUBATION OF THREE FEMALE BLACKBURNIAN WARBLERS

		Periods on Nest			*Periods off nest*			
	Day of incubation	Number periods	Average length[1]	Range[1]	Number periods	Average length[1]	Range[1]	Percentage of attentiveness
Nest A	4th	2		26, 35	2		7, 16	
	5th	5	24.6	10–31	6	8.0	5–11	73
Nest B	2nd	5	24.6	21–34	5	6.6	5– 8	
	8th	4	19.3	16–23	5	5.4	4– 9	
	10th	7	18.1	9–22	8	3.9	2– 9	
	12th	5	20.8	18–23	5	1.8	1– 3	83
Nest C	3rd	2		42, 86	3	12.0	10–14	80
Totals for A and B		28	22.0		31	5.5		77

[1] In minutes

TABLE 2
INCUBATION RHYTHM OF SIX SPECIES OF WOOD WARBLERS

	Periods on nest		*Periods off nest*		
	Average length[1]	Median length[1]	Average length[1]	Median length[1]	Percentage of Attentiveness
Blackburnian Warbler	22.0	22.0	5.5	5.0	77
Magnolia Warbler	16.9	16.0	7.4	7.0	70
Chestnut-sided Warbler	34.2	26.5	7.0	7.0	83
Nashville Warbler	39.5	41.5	14.4	12.5	72
(tropical)					
M. miniatus hellmayri	37.6	—	18.2	—	67.4
M. torquatus	28.9	—	9.8	—	—

[1] In minutes

unchanged. In the Chestnut-sided Warbler which I studied (1948), both on and off periods lengthened with the progress of incubation.

My data are too few for definite conclusions to be drawn as to the influence of temperature on the rhythm of incubation. But B's high average attentive periods on the second and twelfth days may have been influenced by low temperatures of 50°–60° F prevailing on these days. The data might also suggest that while the periods on the nest of this bird may have been affected by the temperature, her periods off were not, but these varied instead according to the stage of incubation.

The male exercised some influence over the length of the female's periods on and off the nest. In my presence Male A interrupted 2 periods that were

shorter than average, one of only 10 minutes, by giving loud signal songs close to the nest site whereupon the female left and joined him. Male B caused his mate to leave the nest 8 times after incubating for periods, 6 of which were shorter than average. Two of these 6 were of only 9 and 10 minutes duration. At times this male was seen accompanying the female on her return to the nest, obviously delaying her by his mere presence—once for her longest absence, 11 minutes. On the whole, Male B was more attentive to his mate and nest than the other two males watched; on 3 occasions he was seen coming to the nest and feeding the incubating female, once on the fifth day and twice on the tenth day of incubation.

Care of Young

Unfortunately neither of the two broods that hatched were fledged. At Nest C the young disappeared at the age of 2 days. At Nest B the female was taken by a Pigeon Hawk (*Falco columbarius*) when the young were 4 days old. The next day all young were dead, presumably from lack of brooding.

Both nests were watched during hatching day. The young of Nest C hatched on July 19. This nest was watched for 40 minutes, during which time the female did not brood although the morning was rather cool. She alone fed the young 5 times, averaging once every 8 minutes. The male was already molting heavily at this time and I do not know definitely whether or not his absence was connected with his ignorance of the existence of his offspring. In the Chestnut-sided Warbler (Lawrence, 1948:210), the female also performed the feedings alone immediately after her 3 young hatched, at an average rate of once in 21 minutes. In this case the male did not know of the hatching for the entire duration of my watch so far as I could judge.

At Nest B the male was well aware of the existence of his young when I began to watch at 7:55 a.m. on June 24. During the time of observation he fed the young 5 times, while the female fed them only twice, averaging a combined rate of feeding of once in 26 minutes. The female was occupied mainly by brooding 84 per cent of the time in periods on averaging 34.5 minutes and periods off averaging 6.2 minutes. Twice while the female brooded, the male arrived with food. She hopped on the rim, allowing him to feed the young while she watched. The male carried food visibly in the bill and he fed *more than one* young at each visit. Both parents swallowed fecal sacs.

The next day, during 3 hours of observation when presumably all the young had hatched, the female brooded 79 per cent of the time in periods on averaging 14.2 minutes and periods off averaging 3.7 minutes. On this day, the young were fed an average of once in 10 minutes, both parents having increased their rates of feeding and the female her share of feeding as well, bringing it up from 29 to 36 per cent of the total feedings.

Apart from the number of young in the nest, the feeding rate of some small passerines evidently is influenced also by whether one or several young are fed by the parent at each visit, the rate being faster in the first case. For example, in the Chestnut-sided Warbler (Lawrence, 1948:210) and a Black-throated Blue Warbler, *Dendroica caerulescens* (Nice, 1930:339), only one young was fed at each visit. In the first species, the average feeding rate at the age of 3 days was once in 9 minutes and at 4 days once in 5 minutes for an average of one feeding every 7 minutes; in the second species, the rate was once in 7.5 and 6.4 minutes at the same ages, also averaging once every 7 minutes. In a Magnolia Warbler (Nice, 1926:198), more than one young was fed once in 10 visits; here the average rate at the age of 4 days was once in 8 minutes. By comparison, in my Blackburnian Warblers where more than one young were fed at each visit the average feeding rate at the ages of 1, 4, and 5 days (female B was killed on the fourth day) was once in a little over 13 minutes.

Moreover, it is known that birds which bring larger amounts of food at each visit feed their young less often than those which bring smaller helpings (see Nice, 1943:235), a circumstance which may possibly depend on the kind of insects each species generally prefers. Caterpillars, dragonflies, mayflies, for instance, are bulky insects as compared to mosquitoes, gnats, or certain spiders. Because the food carried by the Blackburnian Warblers as they moved about in the tops of 60 to 70 foot pines was plainly visible to me on the ground through 8 × 30 binoculars, the amount of each feeding must be considered as large. Sometimes when the warblers happened to come within closer range I was able to identify the food—once as a green larva and several times as mayflies. Hence, apart from the modifying influence of the events that occurred at this nesting (Nest B), two factors, *i.e.*, the number of young fed at each visit and the size of the meals, provided good reasons for the comparatively slow rate of feeding I found in this warbler.

Female B was killed in the morning in the absence of the male. The first time he came to the nest after it happened he was obviously affected by not finding her near the nest as usual. He hopped around "nervously" with his bill full of food, he glanced in this and that direction, but finally went to the young and fed them. Based on 51 minutes watching before the female was killed, the feeding rate of both parents was once in 17 minutes. After her death, during 129 minutes of observation, the male alone fed the young on an average once in 16 minutes. The next day I watched him feed them 5 times in 68 minutes, or once every 14 minutes. While there appears to be an acceleration in the male's feeding after the female vanished, his mean rate during the fourth and fifth days' watches equals that of the 3-hour watch on the first day, *i.e.*, once every 15 minutes. Keeping in mind the increasing need for food of the young, we should perhaps have found an increased rate of

feeding from the first to the fifth day of nest-life in this male. The lack of this might be accounted for by a change in the number of young in the nest; I had no means of knowing how many hatched or if any disappeared during these days.

In all the time I watched him, Male B showed a clearly defined rhythm in his feeding. In one hour he would feed once or twice, followed by a half hour in which he fed 3, 4, or even 5 times, in rapid succession, after which he repeated the series again. In this way he allowed himself time for preening, resting, and feeding himself between periods of close attendance upon the young. He maintained this rhythm rigidly also after the female was killed.

It seems safe to conclude that my Blackburnian Warbler male was not fitted to raise his brood alone after the loss of the female. Even had the young been able to survive the lack of brooding (which I think was the main reason for their dying), it is questionable whether the male could have kept abreast of their increasing need for food as they grew, although normally he might have increased his rate of feeding and/or the size of his offerings towards the end of the nest-life.

Song

Saunders (1951:194) described the song of this warbler as consisting of two parts—a series of notes in even time and a trill sometimes higher and sometimes lower in pitch than the first notes. He gave examples of 3 different songs.

At Pimisi Bay I recorded 5 different types of song and additionally one courtship-song.

(1) The most common was the long single-note song with rising end-trill (Saunders' No. 3). The length of this song was from 1 to 1½ seconds. Certain males used it almost exclusively, although some sang both this song and that (2) described below. Male B favored this version all through his nesting. After the young died, he began singing again, with particular vigor and intensity in the early morning and into the forenoon, and early in this period often unusually late at night (one record at 8 p.m.). But no new female presented herself and his singing gradually decreased until after July 12, 13 days after the young died, he was heard no longer.

(2) The long double-note song with higher end-trill (Saunders' No. 1) lasted longer than (1), from 1½ to 2 seconds. This also was a song that certain males used almost exclusively. Sometimes, however, I have heard it given by any male as a challenge song when another Blackburnian Warbler invaded his territory and fighting ensued.

(3) Only once I heard songs with double first notes and lower trill (Saunders' No. 2). This song was given by a migrating male passing through the study area.

(4) Half songs were a fourth variety. These songs consisted of the preliminary notes only, without the ending trill, *zree-zree-zree-zree* or *tsevee-tsevee-tsevee-tsevee*, either one used separately on various occasions. These "half-songs" were not heard before the later part of the nestings and perhaps are correlated with the decline of singing.

(5) Male C often sang "half-songs" during his second nesting and he was also heard giving a fifth version—*tse-tse-tse-tse-tsii* with rising inflection at the end. Nice (1939:92) records a similar song but with the last note lower than the rest.

Male C also furnished me with the sole example of a courtship song. At the time I heard it I described it as a short twittering song given at the moment of copulation.

It is noteworthy that in Allegany State Park, New York, Saunders heard the Blackburnian Warbler give songs with double preliminary notes and descending end-trills, and Kendeigh (1947:71), having listened to the birds at Black Sturgeon Lake, north of Lake Superior, remarked that their most common songs were with single preliminary notes and rising end-trill. Nice (1932), in her study of one bird at Pelham, Massachusetts, recorded no song with double first notes but did hear songs with the trills both higher and lower in pitch than the first notes.

From these published observations and mine at Pimisi Bay it may be concluded that the use of the various types of long songs is mainly individual rather than related either to occasion or time in the nesting cycle. In such a case, the preference or ability to sing certain types of song may be a matter of inheritance. This would explain why in one place Blackburnian Warbler songs of one type are more common than the others, while the types of song unusual for that district are heard only from birds passing through in migration.

One call-note was heard. It was used both when scolding and when alarmed, but I could hear no difference of enunciation on the two occasions. Sometimes there appeared to be a slight variation in the note as given by individual birds. The note *chit, chit* (Saunders' *tseek*) is not so sharp as the call-note of the Nashville Warbler, but is otherwise similar.

Dispersal

In the 8 years, 1944-1951, the dates when the Blackburnian Warbler was last seen ranged from August 12 to September 17, the mean being September 2 and the median, September 6. Migration of warblers in general usually begins during the last days of July when the first flocks passing southward may be seen. I have no evidence of any resident Blackburnian Warbler remaining on the nesting territory even as late as this, nor of a third nesting being attempted after two previous failures. The onset of the postnuptial molt

in this region seems to mark the end of the breeding season. Blackburnian Warblers seen during the last three weeks of July are overwhelmingly "molty" in appearance. With the onset of the molt singing ends abruptly and the birds move out of their territories, often pursued by a string of fledglings still begging to be fed.

Acknowledgments

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Summary

This study was based primarily on observation of 3 pairs of Blackburnian Warblers occupying the same territory in 1946, 1948, and 1950 and, secondarily, on field notes obtained during the years 1943 to 1951.

The spring arrival date for 9 years at Pimisi Bay was May 12, the median May 13. The females of given pairs were seen about 9 days later than the males.

Habitat requirements of the species were mature evergreens, either in climax stands or sparsely intermingled with deciduous growth.

A total of 34 hours was spent watching activities at 3 nests. The building of the nest was completed in an average time of a little over 4 days, but more time was spent on the early nests than on one started later. The female alone built the nest. The male accompanied her, displayed to her, and sometimes effected coitus during the nest-building. There was a notable decrease in building activity toward the end of the day and toward the completion of the nest.

Nests were located in evergreens, most often in white pines, at heights varying from 26 to about 55 feet. A preferred site was on horizontal branches well out from the trunk. The nesting materials consisted mainly of dry twigs, fine grasses, rootlets, and evergreen leaves. Spider silk, collected during the first day of building, was an important item in two nests and was used to attach the nest to the branch.

The female alone incubated. Her average duration of time on the nest was 22.0 minutes, with 5 minutes off for feeding and resting. The mean percentage of attentiveness was 77. The male exercised an influence on the length of the periods off and on the nest by causing the female to leave when she heard him sing loudly or call near by, and by delaying her return by distracting her with his company. One male fed his mate on the nest on 3 occasions during incubation.

On the twelfth day at Nest C and the thirteenth day at Nest B after the female began incubating steadily, young were being fed. At Nest B the male undertook the larger share of the feeding of the young, while the female spent most of her time brooding. The female at this nest was killed by a Pigeon Hawk on the fourth day of nest-life, but the male did not respond effectively to the emergency and the young died the next day, mainly from lack of brooding.

Five types of song as well as one courtship song and one call-note were recorded.

The Blackburnian Warblers left their territories immediately after the nesting cycle was concluded and the postnuptial molt began. This occurred comparatively early, about mid-July. No third nesting was undertaken after two previous unsuccessful attempts. The birds began their southward migration through this region in the end of July. In the past 8 years, the mean date when the Blackburnian Warbler was last seen was September 2, but the median date was September 6.

Literature Cited

Brooks, M.
1947 Breeding habitats of certain wood warblers in the unglaciated Appalachian region. *Auk*, 64:291–295.

Chapman, F. M.
1940 Handbook of birds of eastern North America. D. Appleton-Century Company, New York.

Kendeigh, S. C.
1945a Community selection by birds on the Helderberg Plateau of New York. *Auk*, 62:418–436.
1945b Nesting behavior of wood warblers. *Wilson Bull.*, 57:145–164.
1947 Bird population studies in the coniferous forest biome during a spruce budworm outbreak. *Depart. Lands and Forests, Ontario, Can., Biol. Bull.*, 1:1–100.

Lawrence, L. de K.
1948 Comparative study of the nesting behavior of Chestnut-sided and Nashville warblers, *Auk*, 65:204–219.

Nice, M. M.
1926 A study of a nesting of Magnolia Warblers (Dendroica magnolia). *Wilson Bull.*, 38:185–199.
1930 A study of a nesting of Black-throated Blue Warblers. *Auk*, 47:338–345.
1932 Habits of the Blackburnian Warbler in Pelham, Massachusetts. *Auk*, 49:92-93.
1943 Studies in the life history of the Song Sparrow II. *Trans. Linnean Soc. New York*, 6:i–viii, 1–329.

Saunders, A. A.
1951 A guide to birdsongs. Doubleday and Company, Inc., New York.

Skutch, A. F.
1945 Studies of Central American redstarts. *Wilson Bull.*, 57:217–242.

Rutherglen, Ontario, Canada, July 20, 1952

ON THE NAME OF THE NORTHERN BALD EAGLE AND THE IDENTITY OF AUDUBON'S GIGANTIC "BIRD OF WASHINGTON"

BY ROBERT M. MENGEL

DURING his extraordinary career, John James Audubon was pardonably confused about the identities of some of the myriad, little-known birds in the wilderness around him. Some of his early misconceptions he cleared up himself; others continued to baffle ornithologists long after his death.

A case in point is furnished by his remarkable "Bird of Washington" (*Falco washingtonii* Audubon, Ornithological Biography, 1, 1831:58–65), long thought to have been an immature Bald Eagle (*Haliaeetus leucocephalus*). Although Audubon came to realize that the dark young and the white-headed, white-tailed adults of the Bald Eagle belonged to the same species, he continued steadfastly to believe in the existence of another sea eagle in eastern North America—a larger, fiercer, still more magnificent creature—the "Bird of Washington." Before discussing the complexities which resulted from this belief, let us consider briefly Audubon's feelings about the matter. He wrote (*op. cit.*, p. 61):

> . . . as it is indisputably the noblest bird of its genus that has yet been discovered in the United States, I trust I shall be allowed to honour it with the name of one yet nobler, who was the saviour of his country, and whose name will ever be dear to it. To those who may be curious to know my reasons, I can only say, that, as the new world gave me birth and liberty, the great man who assured its independence is next to my heart. He had a nobility of mind, and a generosity of soul, such as are seldom possessed. He was brave, so is the eagle; like it, too, he was the terror of his foes; and his fame, extending from pole to pole, resembles the majestic soaring of the mightiest of the feathered tribe. If America has reason to be proud of her Washington, so has she to be proud of her Great Eagle.

It is easily seen that the great naturalist's intense emotions were aroused over and above his normal enthusiasm at what he believed to be a bird new to science. The Washington Eagle was formally presented to science with plate 11 of the elephant folio (1827), in which the bird looks much like an immature Bald Eagle. Its description was completed with the written account that followed (1831), which will be considered further below.

The Bird of Washington, virtually forgotten and long buried in the crypts of synonymy, reappeared on the nomenclatural scene in connection with the large Bald Eagles of the northern part of the North American continent, which had been separated by Townsend (1897) under the name *alascanus* (type locality: Unalaska, Aleutian Islands; type specimen: male, U. S. National Museum No. 151567). Townsend's name stood for the northern sub-

species until Peters (1931:258) replaced it with the older name *washingtoniensis* Audubon (elephant folio), explaining his action by the words (footnote): "Audubon's type of *washingtoniensis* had a wing measurement of 32 inches; 4 inches longer than any Alaskan specimen measured by me if measured the same way."

Bent (1937:333) and the American Ornithologists' Union Check-List (1944:445) shortly followed suit. Soon afterward it became necessary to change the name once again (A. O. U., 1948:439), this time to *washingtonii*, because a number of the elephant folio plates by one engraver (Lizars) bore the name *washingtoniensis*, while others in the same edition (engraved by Havell) were labelled *washingtonii*. Therefore, the use of the name *washingtoni* by Bangs (1898:174) for the Bald Eagles of the northeastern United States fixed the one to be used, according to the "principle of first reviser." The northern Bald Eagle thus became *Haliaeetus leucocephalus washingtonii* (Audubon), with Henderson, Kentucky, where Audubon secured his specimen, as type locality. Audubon's name belonged once more to a bird, if to a less spectacular one than he had originally envisioned.

The logic of Peters' reasoning is obvious, but vulnerable. If Audubon's bird from Henderson was too large for a southern Bald Eagle, too large, in fact, for any known northern bird, it must have been a northern bird. But the question here is, how much too large? The picture evoked by a careful consideration of the original written description is downright unnerving.

I am not the first to appreciate this. Many years ago J. A. Allen (1870) brilliantly reviewed what was then known and thought about Audubon's great eagle, remarking on its incredible size and concluding, doubtfully, that it may have been an extremely large, immature Bald Eagle. He stated in closing that "a 'few grains of allowance' may be safely made for slight inaccuracies on the part of its enthusiastic discoverer." Much later, Friedmann (1950:495) expressed similar doubts, stating that the wingspread (of 10 feet and 2 inches) was too great for any eagle. Carrying this line of thought somewhat further, I found that *all* of the measurements were, as Friedmann put it, "undoubtedly exaggerated," or that Audubon had before him a form of eagle which no longer exists, or that he was in possession of a freak individual. A statistical analysis, the details of which follow, shows that one or another of these conclusions is inevitable.

Table 1 shows the disparity of certain of Audubon's measurements (converted to millimeters) of his type with those of northern birds given by Friedmann (*op. cit.*, p. 489). Audubon said his specimen was a male, but even supposing he mis-sexed the bird, we see his huge eagle to have been much larger than recorded female northern Bald Eagles.

TABLE 1

COMPARISON OF MEASUREMENTS OF MALE AND FEMALE *Haliaeetus leucocephalus alascanus* TOWNSEND* WITH THOSE OF THE TYPE OF *Falco washingtonii* AUDUBON (MALE?)

	washingtonii (1 specimen)	*alascanus* ♂♂ (29 specimens)		*alascanus* ♀♀ (42 specimens)	
		range	*mean*	*range*	*mean*
Wing	812 mm. (32 in.)	570–612	(588.6)	605–685	(640.2)
Tail	381 mm. (15 in.)	290–322	(309.7)	300–365	(339.4)
Tarsus	114.3 mm. (4½ in.)	84.5–106	(99.8)	83–110	(101.9)
Wingspread	10 ft. 2 in.				

* I am indebted for some of the measurements to Dr. Herbert Friedmann.

The results of a statistical analysis of the variability of wing length in a number of *female* eagles are shown in Figure 1. The measurements used were taken from Alaskan specimens and winter-collected birds from the northern United States, and hence were among the largest available. Wing measurement was chosen because of its prevalence in taxonomic work, and because of its fairly low relative variability. Figure 1 also shows the theoretical characteristics of a hypothetical population represented by the type of *washingtonii*. These characteristics were arrived at by making the logically justifiable assumptions that the coefficients of variability in forms presumed to be closely related are roughly similar, and that Audubon's type was an individual near the mean of its population. Using the coefficient of variability for a known population (of Bald Eagles in this case), one can compute the theoretical standard deviation of the unknown population. Details and discussions of this technique have been given recently by Fisher (1952).

If one assumes Audubon's specimen to have been approximately average in size, virtually no overlap is found between the greatest wing length expected in modern [*i.e.*, known] *female* Bald Eagles and the lowest expected wing length in the hypothetical population. For added safety, I have also assumed Audubon's specimen to have been nearly the largest possible example of its population, and placed a second theoretical mean three standard deviations below the first, computing another expected range from the new mean. Since the second mean is smaller, and the standard deviation varies with the mean, it is necessary in this case to compute a new theoretical standard deviation, although this was not mentioned by Fisher. In this second case, as shown by Figure 1, some overlap would occur, but the separability of populations is still more than 97 per cent of recent eagles from 84 per cent of "Audubon eagles," more than enough by most present-day taxonomists' standards for subspecific recognition. The differences are so great that minor variables,

such as the difference between chord and flat measurements, would not significantly affect the results. We are faced by the single hard fact that Audubon's type, which is all that we have to go on, was far too large to be considered a Bald Eagle of either sex or of either present-day race. Had I compared Audubon's "male" bird with male northern Bald Eagles, it would have been impossible to fit the figure into this page using this scale!

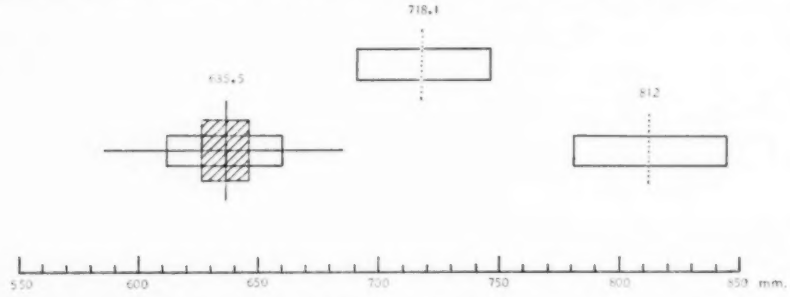

FIG. 1. Variability in wing length of 25 females of *Haliaeetus leucocephalus alascanus*, compared with the theoretical variability in the same measurement of "*Falco Washingtonii*." Shaded rectangle = mean ± 2 standard errors. Unshaded rectangles = means ± 1 standard deviation. Horizontal line = observed range of 25 females of *alascanus*. Solid vertical line = mean of *alascanus*. Dotted vertical lines = assumed means of *washingtonii*. *Haliaeetus leucocephalus alascanus:* number of specimens (N) = 25; mean (M) = 635.5; standard deviation (σ) = 24.5; standard error of the mean (σm) = 4.9; coefficient of variation (V) = 3.85 (measurements in millimeters). *Falco washingtonii:* (assuming type is average in size) N = 1; M = 812; V = 3.85; σ = 31.3; (assuming type is nearly the largest of population) N = 1; M = 718.1; V = 3.85; σ = 27.7.

Inspection of the other measurements (Table 1) suggests that some or all of them, treated statistically, would also show differences sufficiently great to merit nomenclatural recognition by present standards. I have not gone further, as the argument is carried by one demonstration and, after all, we do not know how (and let me suggest, reluctantly, if) Audubon actually made his measurements.

The assumptions that may now be made are three. Let us consider the least probable, and the most interesting, first. This is the remote possibility, properly derided by many earlier naturalists, that Audubon actually had an eagle of the genus *Haliaeetus*, of the size described, and specifically distinct from *leucocephalus*—a species that became extinct before its existence was otherwise indicated. There is, of course, no evidence from other sources of the presence of such a form in historic times. However, the peculiarity of the tarsal scalation, and the odd conformation of the cere, as shown in Audubon's plate, provide material for speculation of this sort, as neither is at all typical

of the Bald Eagle. The characters of the tarsus have been discussed at some length by Allen (*op. cit.*) and Gilpin (1873), both authors concluding that to blame for the irregularity. The atypical cere does not seem to have been carelessness on the part of Audubon, his engravers, or both, may have been mentioned previously, and was brought to my attention by J. Van Tyne.

It is also thought-provoking to read Audubon's description of the nesting of a pair of the brown Birds of Washington on a cliff at the mouth of Green River, near Henderson (*op. cit.*, pp. 58–60). The possibility, suggested by their choice of the cliff site, that these were in fact Golden Eagles (*Aquila chrysaëtos*) is rendered unlikely by his explicit account of their feeding largely upon fish. The point is that nesting pairs of two immature Bald Eagles probably do not occur at all; they are at any rate so rare that none were known to Bent (1937:322), matings involving even one immature being very unusual. Quite possibly subadult Bald Eagles lack sufficient sexual initiative to bring about successful mating and rearing of a family by two immature birds, although one individual may be capable upon occasion of mating satisfactorily with an adult. Strong evidence against the possible specific validity of Audubon's bird, however, is the fact that no species of *Haliaeetus* other than *leucocephalus* has been discovered in Pleistocene deposits of the United States, and the known fossils are apparently little, if any, larger than large modern Bald Eagles (Howard, 1932:44).

The second possible conclusion is that some genetic or developmental anomaly was responsible for the size of Audubon's bird, assuming it to have been a Bald Eagle. This also seems unlikely, but were it true, the aberration probably could have sprung as readily from one population as from another.

The final possibility, and by far the most probable, is that the measurements are simply unreliable. Whether they were supplied erroneously from memory, resulted from a different system of measurement from that now used, or were accidentally or intentionally falsified does not particularly concern us here. We are clearly not justified in assuming, because Audubon's measurements are too large for *any* Bald Eagle, that the bird must have been a *northern* Bald Eagle. If the measurements are in error, and we have seen the overwhelming probability that they are, there is no way of telling the magnitude of the error or its direction. (Add to this the point that, to keep the discrepancy from being much greater still, we have to assume—with dubious justification—that Audubon mis-sexed his specimen.) No case can be made for the application of the measurements or names based on this specimen to any population of the Bald Eagle.

If Audubon put down the measurements of *washingtonii* from memory, fabricating or exaggerating them to suit his inflamed fancy, the case comes within the meaning of Opinion Number 2 of the International Commission on

Zoological Nomenclature: ". . . we name the objects themselves, not our conception of said objects," and the name is invalid. In any event, the situation is summed up by Canon XLV of the American Ornithologists' Union Code of Nomenclature (1892:53), which states: "Absolute identification is requisite in order to displace a modern current name by an older obscure one." Such identification is lacking.

No specimen certainly identified by Audubon as a Washington Eagle appears to exist. The type of *washingtonii*, presented by Audubon to his friend, Dr. Rankin, was apparently not preserved (Allen, *op. cit.*). The northern Bald Eagle, as currently defined (see Peters, *loc. cit.*) does not breed in Kentucky. Consequently it will prove convenient, as well as necessary, to fall back on Townsend's name. The inimitable Elliott Coues once said, prophetically (Gilpin, 1873:430, footnote), "I wonder how many more times the 'Washington Eagle' must be put down before it will stay down!" Perhaps his question can finally be answered.

Neither *Falco washingtonii* Audubon nor *Falco washingtoniensis* Audubon is a *nomen nudum*, since they are accompanied by a plate and a figure in the first instance and a plate in the second, but neither name belongs in the synonymy of the Bald Eagle. The Washington Eagle should be placed with hypothetical species such as the Blue Mountain Warbler (*Sylvia montana* Wilson) and similarly unidentifiable forms. The subspecies of the Bald Eagle should henceforth stand as:

Haliaeetus leucocephalus leucocephalus (Linnaeus)
Falco leucocephalus Linnaeus
Haliaeetus leucocephalus alascanus Townsend
Haliaeetus leucocephalus alascanus Townsend
Haliaeetus leucocephalus washingtoni Bangs
Haliaeetus leucocephalus washingtoniensis Peters

Literature Cited

Allen, J. A.
1870 What is the "Washington Eagle"? *Amer. Naturalist*, 4:524–527.

American Ornithologists' Union
1892 The code of nomenclature adopted by the American Ornithologists' Union. New York, 72 pp.
1944 Nineteenth supplement to the American Ornithologists' Union check-list of North American birds. *Auk*, 61:441–464.
1948 Twenty-third supplement to the American Ornithologists' Union check-list of North American birds. *Auk*, 65:438–443.

Audubon, J. J.
1827 The birds of America (folio ed.), Vol. 1. Published by the author, London, 100 pls.
1831 Ornithological biography. Vol. 1. Adam Black, Edinburgh, 512 pp.

BANGS, O.
1898 Some new races of birds from eastern North America. *Auk*, 15:173–183.
BENT, A. C.
1937 Life histories of North American birds of prey (part 1). *U. S. Natl. Mus. Bull.* 167, 409 pp.
FISHER, H. I.
1952 The validity of the fossil crane Grus nannodes. *Condor*, 54:205–206.
FRIEDMANN, H.
1950 The birds of North and Middle America. *U. S. Natl. Mus. Bull.* 50, part 11, 793 pp.
GILPIN, J. B.
1873 Variation in the tarsal envelope of the Bald Eagle. *Amer. Naturalist*, 7:429–430.
HOWARD, H.
1932 Eagles and eagle-like vultures of the Pleistocene of Rancho La Brea. *Contrib. Paleont. Carnegie Inst. Wash.*, No. 429, 82 pp.
PETER, J. L.
1931 Check-list of birds of the world. Vol. 1. Harvard University Press, Cambridge, 345 pp.
TOWNSEND, C. H.
1897 Descriptions of a new eagle from Alaska and a new squirrel from Lower California. *Proc. Biol. Soc. Wash.*, 11:145–146.

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LIFE-HISTORY OF THE PROTHONOTARY WARBLER

BY LAWRENCE H. WALKINSHAW

DURING the years 1937 through 1945, I studied the Prothonotary Warbler (*Protonotaria citrea*) in an area along the Battle Creek River in Convis Township, Calhoun County, Michigan. The area consisted of the winding river and adjoining bottomlands and was nearly two-thirds of a mile (1069 meters) long (about 9460 feet or 2859 meters by river) and approximately 88 acres (35.62 hectares) in area. During the war years fewer trips were made to the area but enough search was made to identify the banded birds.

Much of the information obtained in my first year's study was published in *Bird Banding* (1938. 9:32-46); additional information, on the 1938 season, in *The Jack-Pine Warbler* (1939. 7:64-71); and a comparison of the studies made in Michigan and at Reelfoot Lake, Tennessee, through 1940 was published in *The Wilson Bulletin* (1941. 53:3-21). Since I was unable to visit the Tennessee area after 1940, I was not able to get information on the banded birds which were studied there during 1939 and 1940. This paper deals almost entirely with the Michigan birds. Table 1 gives the first date Prothonotaries were observed at Battle Creek and the date of the first-laid egg, for each year.

TERRITORY

Upon arrival on the Michigan nesting grounds, the male Prothonotary Warbler immediately stakes out his territorial claim. I have never found a territory in other than the immediate vicinity of well-shaded water, either running or in stagnant pools. Of 84 nests found in "natural" locations, 29 were over standing water, 32 along the edge of running water or over it, and the remaining 23 over dry land. The last 23 were from .61 to 137.8 meters from the river bank and usually in easily flooded spots. Nearly all of the nests were shaded most of the day. In one nest, upon which the mid-day sun shone during the nestling period, all of the young died one hot afternoon. There are other requisites besides shade and water for a good nesting site. The sites are usually not very high. Where bird houses were used, I found the birds preferred sites between one and two meters above the water, but would nest in houses whether they were only a few centimeters above the water or three or four meters high. Of the nests located in natural sites, 43 were in various cavities and 41 in woodpecker holes. Downy Woodpecker (*Dendrocopos pubescens*) holes were preferred. Forty-one nests were located from 61 to 152 cm. above the ground or water; 21, between 152 and 304 cm.; 20, between 304 and 450 cm.; and two even higher. The highest nest was 10.4 meters above ground.

I usually found the first male of the year in the early morning. Often there had been no bird in the same place the day before. At first, territories were rather large, taking in great stretches of river. As other males arrived, battles ensued, the new males each finally taking possession of some restricted water frontage and the earliest male trying to retain as much as

FIG. 1. Nesting habitat of Prothonotary Warbler in Calhoun County, Michigan. One pair nested in the dead stub near the blind. Photographed by Lawrence H. Walkinshaw on June 13, 1948.

possible of his original territory. These battles sometimes lasted for two or three days. One male would chase another, back and forth, up and down, through the vegetation, until both were thoroughly tired. Often they stopped to rest but almost as quickly started again—sometimes switching roles of pursuer and pursed. Eventually territorial boundaries were established and regular battles were discontinued. In territories along the river bank, regardless of how irregular the stream, the males battled more for the river bank than for the portion of the territory back in the dry woods. In areas where the river almost encircled land, one male nearly always controlled the encircled land.

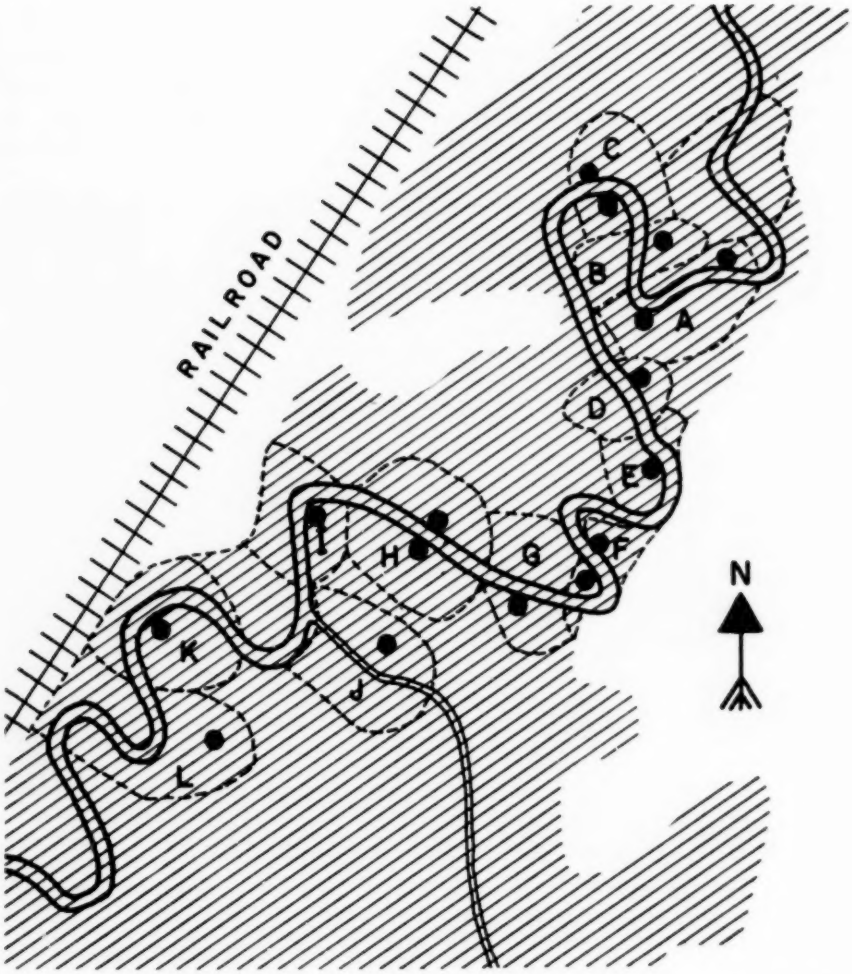


FIG. 2. Nesting territories (enclosed by dotted lines) of the Prothonotary Warbler along the Battle Creek River, Michigan, in 1941. The shaded portion represents bottomland woods; black circles represent nests. Figs. 3-7 reproduce the same area.

The male almost always selected the first nesting site before the female arrived. Often he carried a mass of moss for the base of the new nest into the bottom of the selected cavity. When the female arrived, she completed the nest shortly and a few days usually intervened before egg laying began.

Often a nesting site was selected first and then territory established around it. An example of this occurred in Tennessee at a bird house used during

the summer of 1939 by three different pairs of banded Prothonotaries, all of which reared young. The first pair used the house from April 18 until May 24; the second pair, May 30 to June 24; the third pair, from early July until early August. The first pair disappeared after nesting; the second pair moved about 150 meters to a new site after nesting in the bird house; the nesting site of the third pair prior to their nesting in the bird house was not known.

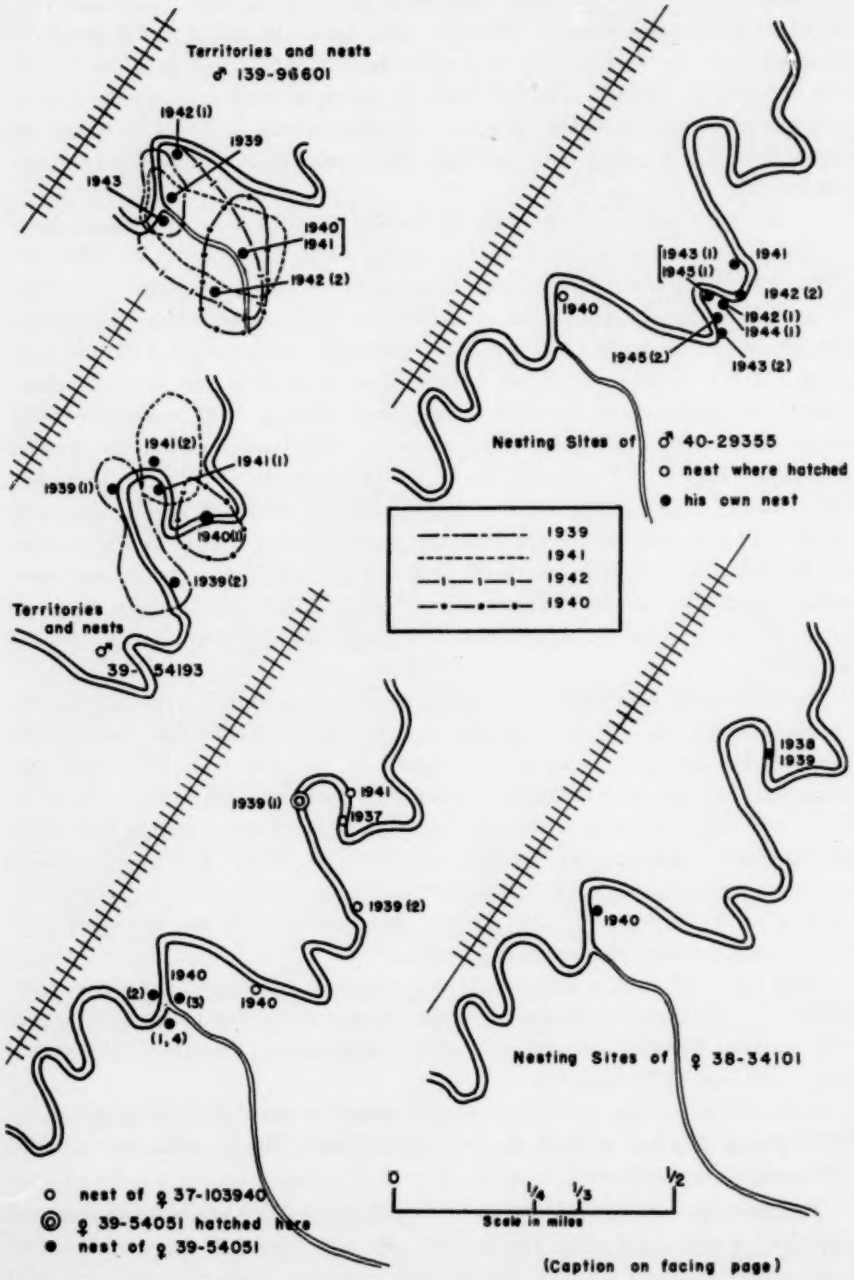
In the Michigan study area the following Prothonotary Warblers nested during the seven summers: 1937, 11 pairs; 1938, 12; 1939, 15; 1940, 19; 1941, 13; 1942, 14; 1943, 14—an average of 14 pairs per year. In 1941 (Fig. 2) the approximate sizes of territories were recorded, averaging for the 13 pairs 3.66 acres (148 ares) per pair with extremes of 1.90 and 6.38 acres (76.8 to 258 ares). Some territories were much larger in total extent, but the entire area was not used at one time. During 1942, male 139-96601 had a territory of 12.41 acres (5.02 hectares) only part of which was used at one time (Fig. 3). Two nests found on this area in 1942 were 1366 feet (412 meters) apart. His 1943 nest, the last one which I found, was only 16 feet (4.9 meters) from the first one found during 1939. His territories during the five summers averaged 9.46 acres (3.82 hectares) in size with extremes of 6.36 and 12.42 acres. The 1940 and 1941 nests were in the same site. Portions of his first year's territory were used each successive year except 1940.

Another male, 40-29355, was banded as a nestling June 16, 1940 (Fig. 4). A nest found during 1941 probably belonged to him. The female was banded, but the male was not captured. It was this male, however, that occupied that territory during the next four summers. He was captured in 1942 and marked with a colored band. His territories were much more concentrated than the territories of no. 139-96601. The entire group covered no more than six acres. His territory size averaged for the four summers 3.16 acres (127.8 ares). The greatest distance between his nests was 491 feet (148.3 meters) during that period.

Male 39-54193 had a different type of territory each year for three years (Fig. 5). The three territories bordered on each other, but barely overlapped. The greatest distance between any of his nests during the three year period was 1226 feet (370 meters).

Male 38-34107 had territories almost equal in size, which overlapped, in 1938 and 1939, but in 1940 he had moved from 990 to 1688 feet (296 to 510 meters) downstream.

Females returned less often than males. If a female's old mate had returned and had a new mate when she arrived, she was forced to mate with a new male. Only one pair remated for the second season, nesting in the same bird



(Caption on facing page)

house in 1938 and 1939. Three other pairs could have remated but did not. The two males returning for five years had different mates each summer. None of their mates was found a second year.

Female 37-103940 was banded in 1937 but in 1938 I did not find her. Every female on the study area was identified but she could have nested a quarter mile or less outside and not have been found. In 1939 she first nested 537 feet (162 meters) from where she nested in 1937. Her second 1939 nest was 934 feet (282.4 meters) from the first 1939 nest. In 1940, she nested 1371 feet (417 meters) downstream and in 1941, 2423 feet (732 meters) upstream from the 1940 nest, but only 211 feet (64 meters) from her 1937 nest (Fig. 6).

General Life History

The early dates of egg-laying and hatching and the time that the young left the nest were given in *The Wilson Bulletin* (1941, 53:6-11). An interesting correlation was found between the average weight of the eggs and the average number of eggs in a set. If one was greater during a year, the other was less, so that the total weight of each set averaged almost the same each year (Tables 2 and 3). I have studied the records of nests in Michigan where the incubation period was known, but find that air temperature apparently had no effect on the length of this period. All incubation periods (*i.e.*, the period between the laying of the last egg and its hatching) were from 12 days to slightly under 14 days. The highest mean temperature during one of these incubation periods at Battle Creek was 71.8°F., May 26 to June 8, 1939. The same incubation period was found for two nests when the mean temperature was the lowest recorded, 61.1°F., May 27 to June 9, 1938. The two shortest incubation periods, 12 days each, occurred when the mean temperatures were 67.0° and 66.5°F., respectively. Thus, at 17 recorded nests, 1937 through 1941, no correlation was found between incubation period and air temperature.

Notes taken at a nest found along the Battle Creek River on June 6, 1948 (see Fig. 1) record the typical home life of the Prothonotary Warbler. The nest contained at least five eggs. It was over the river in a Downy Woodpecker hole in a dead maple about two meters above the water level. The tree was about 34.5 centimeters thick. The territory of the male extended upstream about 50 meters and about the same downstream. He often penetrated inland about the same distance, on either side of the river, but the

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Figs. 3–7 (opposite page). Nesting of Prothonotary Warbler along Battle Creek River, Michigan. Fig. 3, upper left; Fig. 4, upper right; Fig. 5, middle left; Fig. 6, lower left; Fig. 7, lower right. Symbols in the box are the key to identification of nesting territories.

TABLE 1

BREEDING SEASON OF PROTHONOTARY WARBLER IN MICHIGAN †

Year	Record of first male	First April or May day with 70° temperature	Date of first egg	Temperature 4–5 days prior laying of first egg (day in par.)			Termination of last nesting	Number of days between first laid egg and termination of last nesting	
				Date	High	Low		Actual	Possible
1937	May 11*	May 2	May 22	(17)	67°	43°	July 14	53	69
1938	April 27	April 12	May 8	(3)	90°	64°	July 7	60	80
1939	April 26	April 23	May 18	(13)	67°	39°	July 6	49	69
1940	May 6	April 28	May 22	(18)	67°	36°	July 14	53	73
1941	April 29	April 10	May 15	(10)	64°	34°	July 12	58	69
1942	April 29	April 14	May 10	(5)	61°	34°	July 6	57	—
1943	May **	April 24	May 25	(21)	69°	47°	July 1+	37+	—
1944	May 14	April 23	May 20	(15)	87°	55°	.....	—	—
1945	May 6	April 9	May 19	(14)	61°	38°	July 10	52	59
1946	May 1	April 14							
1947	May 11								
1948	May 9		May 23	(18)	69°	46°	July 8	46	—
Mean	May 4	April 19	May 18		70°	43°	July 8	53	69

† Temperatures used under headings 3 and 5 are those recorded at the Battle Creek Weather Station. Under the last heading are two figures: the first shows the number of days between the laying of the first egg and the termination of the last nesting; the second, the possible number of days if the last nest had not been destroyed.

* Recorded by Mr. and Mrs. N. T. Peterson.

** First Prothonotary not back by May 5 after which I was not able to visit area until May 25.

majority of his time was spent on the river banks or in the trees above the river. When I found the nest both male and female Prothonotary Warblers were scolding a female Cowbird (*Molothrus ater*) that was in the nest area and both were trying to drive her away. When the Cowbird left, the male Prothonotary began to sing. About 85 per cent of his song perches were in the shade and about 15 per cent in the open. Some were over the river, some over land, and only one was more than 50 meters from the nest. Song perches at heights in meters listed were used in the following order: 1.83, 1.22, 3.35, 6.7, 7.5, 8.4, 9.1, 10.6, 9.6, .9, 3.6, 4.5, 5.4, 6.7, and 8.4.

When the female left the nest she usually uttered a rapid, sharp chipping. Often the male was silent while she was away from the nest, but started singing when she returned. While she was away he often stayed within five meters of the nest and at times was observed looking into the nest cavity. Often when she returned to the nest, she chipped considerably and he answered with a sharp *zip-zip*. One noon the song sequence of the male was timed. He sang the regular *tweet-tweet-tweet-tweet-tweet* song. The number of *tweets* was listed in each song for some time as: 12, 9, 11, 11, 10, 10, 10, 10,

TABLE 2

SIZE OF PROTHONOTARY WARBLER EGGS

Year	Number of eggs	Average length in mm.	Average width in mm.	Average weight in gm.
1937	78	18.47	14.55	2.07
1938	40	18.68	14.8	2.11
1939	31	18.33	14.88	2.07
1940	47	18.68	14.75	2.12
1941	31	17.74	14.67	1.99
1942	7	18.04	14.35	——
1943	17	17.51	14.48	2.00
1944	18	17.31	14.26	2.00
1945	28	18.01	14.32	2.03
Mean	297 total	18.26	14.62	2.06

TABLE 3

NUMBER AND WEIGHT OF PROTHONOTARY WARBLER EGGS

Year	Number of sets	Average number of eggs per set	Average weight of set in grams
1937	16	5.06	10.4742
1938	18	4.94	10.4234
1939	13	5.07	10.4949
1940	15	4.93	10.4516
1941	13	5.15	10.2485
1942	5	5.20	——
1943	6	5.33	10.6600
1944	3*	6.00	12.0000
1945	5**	4.80	9.7444
Mean	94 total	5.07	10.4531

* Early sets only. ** All late sets.

8, 8, 10, 10, 10, 10, 10, 9, 9, 9, 8, 10, 7, 9, 8, 10, 9, 10, 11, 10, 11, 9. There followed a whisper song, and then a song of 8 *tweets*. During a period of seven minutes he sang per minute, 3, 2, 1, 3, 3, 4, and 1 times. During early morning hours males often gave 7 or 8 songs per minute.

The female, on leaving the nest, flew some distance directly away; as a rule, 135 to 150 meters downstream, but less often upstream, and occasionally inland. Sometimes after feeding she preened for a few minutes. The male at times fed her on the nest as she incubated, but most of her feeding was done away from the nest. Between 9:45 a.m. and 4:00 p.m. on June 6, 1948, she spent 303 minutes on the nest and 73 minutes away (Table 4).

In 1948 the following species of birds were nesting or singing on the 88-acre river area where this pair of Prothonotary Warblers nested. Numbers of pairs as given varied little for the entire period of study, 1937–1945: Wood Duck (*Aix sponsa*), 1 pair; Red-shouldered Hawk (*Buteo lineatus*), 1; Yellow-billed Cuckoo (*Coccyzus americanus*), 1;

TABLE 4

ATTENTIVENESS OF FEMALE PROTHONOTARY WARBLER DURING INCUBATION, JUNE 6, 1948

Female on nest	Time in minutes	Female off nest	Time in minutes
9:45 a.m.–10:51 a.m.	66	10:51 a.m.–11:10 a.m.	19
11:10 a.m.–12:02 p.m.	52	12:02 p.m.–12:17 p.m.	15
12:17 p.m.– 1:15 p.m.	58	1:15 p.m.– 1:29 p.m.	14
1:29 p.m.– 2:17 p.m.	48	2:17 p.m.– 2:24 p.m.	7
2:24 p.m.– 3:04 p.m.	40	3:04 p.m.– 3:11 p.m.	7
3:11 p.m.– 3:50 p.m.	39	3:50 p.m.– 4:00 p.m.	11
Total time	303 minutes		73 minutes
Per cent	80.58		19.41

Barred Owl (*Strix varia*), 1; Ruby-throated Hummingbird (*Archilochus colubris*), 1; Belted Kingfisher (*Megaceryle alcyon*), 1; Red-bellied Woodpecker (*Centurus carolinus*), 1; Hairy Woodpecker (*Dendrocopos villosus*), 1; Downy Woodpecker (*Dendrocopos pubescens*), 1; Crested Flycatcher (*Myiarchus crinitus*), 2; Eastern Phoebe (*Sayornis phoebe*), 1; Acadian Flycatcher (*Empidonax virescens*), 1; Wood Pewee (*Contopus virens*), 2; Rough-winged Swallow (*Stelgidopteryx ruficollis*), 1; Black-capped Chickadee (*Parus atricapillus*), 2; Tufted Titmouse (*Parus bicolor*), 2; White-breasted Nuthatch (*Sitta carolinensis*), 1; Brown Creeper (*Certhia familiaris*), 1; House Wren (*Troglodytes aëdon*), 8 (4 nests found); Catbird (*Dumetella carolinensis*), 1; Robin (*Turdus migratorius*), 2; Wood Thrush (*Hylocichla mustelina*), 1; Veery (*Hylocichla fuscescens*), 1; Blue-gray Gnatcatcher (*Polioptila caerulea*), 1; Starling (*Sturnus vulgaris*), 4; Yellow-throated Vireo (*Vireo flavifrons*), 3; Red-eyed Vireo (*Vireo olivaceus*), 1; Black and White Warbler (*Mniotilta varia*), 1; Prothonotary Warbler (*Protonotaria citrea*), 12 (6 nests found); Golden-winged Warbler (*Vermivora chrysoptera*), 2 (one nest found); Blue-winged Warbler (*Vermivora pinus*), 1; Cerulean Warbler (*Dendroica cerulea*), 3; Louisiana Water-thrush (*Seiurus motacilla*), 4 (one nest found); American Redstart (*Setophaga ruticilla*), 15 (3 nests found); Cowbird (*Molothrus ater*), 4; Scarlet Tanager (*Piranga olivacea*), 1; Cardinal (*Richmondena cardinalis*), 5; Goldfinch (*Spinus tristis*), 3; Field Sparrow (*Spizella pusilla*), 2 (nesting along high bank bordering river); Song Sparrow (*Melospiza melodia*), 8–making a total of 40 species and 105 pairs (210 individuals) on the area of 88 acres–a density of 119 pairs per 100 acres.

The nearest Prothonotary Warblers to the pair studied intensively on June 6, 1948 were 370 meters upstream, but on June 13 another pair moved in about 90 meters upstream and during late May a pair nested 135 meters downstream.

The male vehemently scolded Bronzed Grackles (*Quiscalus quiscula*) which fed in the area but he paid little attention to Red-wings (*Agelaius phoeniceus*) until they were about nine meters from the nest nor was he much excited by other birds that came into the immediate area. Species which came within a meter or two of the nest and were immediately chased were: Black-capped Chickadee, House Wren, Catbird, Robin, Golden-winged Warbler, Mourning Warbler (*Oporornis philadelphia*), Louisiana Water-thrush,

Redstart, Cowbird, Rose-breasted Grosbeak (*Pheucticus ludovicianus*), and Cardinal. The male chased them by darting quickly in their direction. Once a fox squirrel (*Sciurus niger*) was driven away by the male Prothonotary and a male House Wren that nested nearby.

On June 8, 1948, I was back at this nest site again at 4:20 a.m. The male began singing at 4:37 a.m. The morning was cool, the temperature about 53°F., and the sky overcast. The male carried food to the nest for the first time at 4:52 and had made 17 trips to the nest with food by 7:15 a.m. Twelve of them were between 4:52 and 5:29 a.m. After that he sang more and he spent some time scolding and chasing a grackle even when it was 30 meters from the nest. The male was quiet as he approached, but sang immediately after feeding the young. The female made three trips with food. She left the nest for the first time at 5:32 a.m. During four periods she was away from the nest 13, 9, 9, and 8 minutes and brooded the newly hatched young during periods of 23, 18, and 15 minutes. She chipped as she left the nest and chipped considerably more when she neared it on her return. Both birds flew some distance from the nest in search of food.

The following notes were made June 13, 1948, between 12:45 and 3:00 p.m. while I was watching from a blind two meters from the nest: The young were not brooded by the female. Both birds were feeding the young. The male fed them 10 times with an average of 10.4 minutes (2-28) between feedings; the female fed them 9 times with an average of 9.9 minutes (1-25) between feedings. The longest period between feedings was 16 minutes. The male removed excreta six times; the female, twice. The male did considerable singing and sang most often when the nearest neighboring Prothonotary Warbler sang. The young of this pair died during the afternoon because of the excessive heat of the sun beating on their exposed nest site. They were apparently five days old.

In my studies of the Prothonotary Warbler from 1936 through 1948, I followed 178 nestings of which 50 (28.09 per cent) were successful (at least one young raised). Out of 645 eggs, 262 (40.62 per cent) hatched and 191 (29.61 per cent) young left their respective nests. I banded 138 nestlings of which only two have been found in subsequent years. One, a female, nested in the area for one summer; the other, a male, was found the second year after banding and for three additional years.

Returns and Longevity

In 11 years, 1937-1947, 58 adult female and 17 adult male Prothonotary Warblers were banded. These birds were at least one year old when banded and some were probably older. The known age of two nestling returns would be 1.5 years for the female and 5.5 years for the male. Table 5 gives the

TABLE 5

PROTHONOTARY WARBLER RETURNS

	Males	Per cent return	Females	Per cent return	Both sexes	Per cent return
Number banded	18		59		77	
First year return	9	50	12	20.3	21	27.3
Per cent disappeared first year	50		79.7		72.7	
Second year return	4	22.2	6	10.2	10	13.0
Per cent of original number disappearing second year	27.78		10.2		14.3	
Third year return	2	11.1	1	1.7	3	3.9
Per cent of original number disappearing third year	11.1		8.5		9.1	
Fourth year return	2	11.1	1	1.7	3	3.9
Per cent of original number disappearing fourth year	0.0		0.0		0.0	
Fifth year return	0	0.0	0	0.0	0	0.0
Per cent of original number disappearing fifth year	11.1		1.7		3.9	

returns of the adult birds. The two nestlings are entered in this table as one year old. Females did not return to their territories of past seasons nearly so often as males so that the computed survival of males is probably much more accurate and representative. Females often were found some distance from their previous years' nest sites. Banding returns of 18 males known to have lived a total of 35 years indicated that they survived an average of 1.94 years. Since no birds were found dead and none disappeared, except by moving, during the breeding season, I assume that all males died between breeding seasons and probably lived an average of about one-half year additional to the 1.94 years, or 2.44 years. This would be a minimum figure for these adult birds because the ages at which they were banded is not known, except for one bird. Banding returns of 59 females indicate an average age of 1.36 years but again, the females are less prone to return to the previous nesting areas.

HISTORIES OF PAIRS

♂ 38–70502 × ♀ 38–34101 (Fig. 7)

1938 Nest 1

Nest completed May 7; six eggs laid May 8–13; two Cowbird eggs laid May 12; eggs destroyed by some predator May 18; four eggs May 12 weighed 8.7 gm. Female weighed 16.0 grams May 15.

1938 Nest 2

Nest revamped in same site as above nest; five eggs laid May 23–27; one Cowbird egg laid May 25, the same day Prothonotary egg number 1 was found with a bill hole in it. This egg and egg number 2 disappeared May 27; eggs 3 and 4 hatched June 8, egg 5 on June 9; three young left nest June 18 when I touched the house. One landed in river where it swam 50–60 feet (15.1–18.1 meters) to shore; both parents fed young June 26. Eggs measured 18.5 × 14, 19 × 15.5, 19 × 15.5, 19 × 15.5 and 19 × 15.5 mm. Three eggs weighed 6.4 gm. on May 28.

1939 Nest 1

This pair remated the second year. The male first observed May 9; female building nest May 14 in the site of her two 1938 nests; six eggs laid May 21–26; predator destroyed eggs May 27. Birds not seen during remainder of summer. Eggs measured 18 × 15, 18.5 × 15, 18 × 15, 18 × 15, 18.5 × 15.5 and 18.5 × 15.5 mm., and weighed 13.2 gm. on May 26.

Unbanded male × ♀38–34101

1940 Nest 1

Nest with five young about two days old found June 12 in rotted portion of a live ash tree along river bank; five young, including male 40–29355, left nest June 21. Eggs probably laid May 24–28.

The following history pertains to 40–29355 (Fig. 4), son of female 38–34101. During the summer of 1941 he was not positively identified but a pair of Prothonotaries used the same territory that he used during the following four summers. The female was banded 41–73211 and her nest with five eggs was found June 15, but these eggs were destroyed by some predator July 3 or earlier. The nest was in a maple stub on the river bank and 18 feet (5.44 meters) above the water.

♂40–29355 × ♀41–73373

1942 Nest 1

Found with four eggs June 11; June 25, four young; July 3, young and adults gone. Nest in maple stub which had fallen into river and extended about four feet (1.23 meters) above normal water level.

♂40–29355 × ♀41–73269

1943 Nest 1

Nest with two eggs found May 27 in bird house; May 30, nest torn to pieces and eggs gone. House Wren had replaced nest with sticks.

1943 Nest 2

Nest with two young about two days old and three unhatched eggs found June 24; July 1, two young left nest as I photographed them during mid-afternoon when hot sun beat on their stub, a small white ash on river bank. Nest five feet (1.53 meters) above water. Young flew 10 to 18 feet when they left the nest.

♂ 40–29355 × ♀ 140–32248

1944 Nest 1

Female building nest May 14 in nest box; six eggs laid May 20–25; six young hatched about June 8–9; six young left nest about June 17, all banded.

♂ 40–29355 × ♀ 40–29350

1945 Nest 1

Male returned May 6. Nest found in bird house (same house in which this male nested early during 1943, but a different one than that in which he nested during 1944), May 24, containing five eggs and three Cowbird eggs (the box top was ajar as was sometimes found in the spring); eggs probably laid May 18–22; four young Prothonotaries hatched June 4–5; one young Cowbird hatched. Young banded June 14 and left nest June 15.

1945 Nest 2

On June 28 found nest with two eggs in another bird house farther downstream. On July 12, nest was empty and parents could not be found.

Male 40–29355 had a different mate each year and none had been banded previously. These mates laid 32 eggs of which 16 hatched (50.0 per cent) and 12 young (37.5 per cent) left the nest. His mother was known to lay 22 eggs in three summers. Of these eggs, 8 hatched and 8 young (36.4 per cent) left the nest.

♂ 139–96601 × ♀ 39–54195 (Fig. 3)

1939 Nest 1

Nest with five eggs found June 9 (eggs probably laid June 1–5); four eggs hatched June 16 or 17 and four young left the nest June 27 or 28. Nest two and one half feet (76.8 cm.) above ground in rotted top of small dead maple (4 inches in diameter).

♂ 139–96601 × ♀ 40–29312

1940 Nest 1

Nest found July 3 with two newly hatched young and one infertile egg. Eggs probably laid June 16–18. Young left about July 12. Nest two feet (61 cm.) above ground in rotted end of maple stub blown over in bottomland.

♂ 139–96601 × ♀ 41–73204

1941 Nest 1

Nest with five eggs found June 5 in same site as 1940 nest. Still contained five eggs June 15. When I arrived at 2 p.m. June 19 both parents were scolding a pilot black snake (*Elaphe obsoleta*) that was wrapped around the stub and had its head inside the nest. When killed it was found to have swallowed all five young which were about two days old.

♂ 139–96601 × ♀ 40–29310

1942 Nest 1

Found May 15 with one egg and four Cowbird eggs in a semi-open bird house on river bank. Nest destroyed by some predator before June 8.

1942 Nest 2

Found June 21 with five newly-hatched young. One still had pieces of egg shells around it. Four left nest about June 30. Nest eight feet (2.45 meters) above ground in natural hole in six-inch (15.3 cm.) maple.

♂ 139–96601 × Unbanded ♀

1943 Nest 1

Nest found June 17 in natural opening in small maple 18 feet (5.44 meters) above ground. Seven eggs found in nest. Although in good location it was torn to pieces by some predator June 20.

Male 139–96601 had a different mate in each summer for five years. These mates laid 26 eggs of which 16 (61.5 per cent) hatched and 10 young (38.5 per cent) left the nests. Five of the young were eaten by a pilot black snake; another disappeared from its nest.

A female, 37–103940 was banded during 1937. During the four summers I observed her, I was able to capture but one of her mates. During 1938 she did not nest on the study area.

♀ 37–103940 (Fig. 6)

1937 Nest 1

Four eggs laid June 16–19 measured 18 × 14.5, 18.5 × 15, 19 × 16, and 17.5 × 14.75 mm. and weighed 7.5 gm. She weighed 13.6 gm. June 18. Her nest was flooded June 26.

1939 Nest 1

Five eggs laid May 22–26; three measured 17.5 × 13.5, 17.5 ×14, and 18 × 14 mm., and weighed 6.1 gm. Two eggs disappeared, but three hatched and three young left nest June 18–19. Female weighed 16.7 gm. on May 24.

1939 Nest 2

Four eggs laid June 27–30 measured 18 × 14, 18 × 14.5, 18 × 15, and 18 × 15 mm. and weighed 7.2 gm. Destroyed by predator July 6.

1940 Nest 1

Four eggs laid May 25–28 measured 18 × 14.5, 17.5 × 13.5, 18 × 14, and 17.5 × 14 mm. and weighed 7.2 gm. Predator devoured eggs June 2. Female weighed 16.0 gm. May 27.

1941 Nest 1

Nest found June 1 with four young and two infertile eggs. The two eggs measured 17 × 13 and 18 × 14.5 mm. The six eggs were probably laid May 14–19; four young left nest June 10.

1941 Nest 2

Five eggs laid June 14–18 measured 18 × 14.8, 18 × 15, 18.2 × 14.5, 18.5 × 15, and 18.5 × 15 mm., and weighed 10.6 gm. Nest destroyed by predator July 3.

During the five years that she lived on or near the area I found six nests of female 37–103940 containing 28 eggs of which 7 hatched and 7 young left the nests (25.0 per cent). Her eggs averaged 17.94 × 14.45 mm. in measurements and 1.93 gm. in weight. During 1940 her daughter nested about one quarter mile downstream from her. Her daughter, 39–54051, during the summer of 1940, laid 11 eggs which averaged 17.8 × 14.8 mm. in measurements and 2.1 gm. in weight.

Unbanded male × ♀ 39–54051 (daughter of 37–103940) (Fig. 6)

1940 Nest 1

Three eggs laid in bird house on river bank May 29–31. Nest 1436 feet (434 meters) from nest site in which 39–54051 was hatched June 7 or 8, 1939. Her eggs in this nest all measured 18 × 14.5 mm., and weighed a total of 6.1 gm. Some predator took the eggs between June 8 and 11.

1940 Nest 2

Found June 16 in rotted portion of maple stub directly across river from nest 1. Three eggs in nest measured 16.8 × 15, 17.8 × 15, and 18 × 15 mm. There were also two Cowbird eggs, but all were destroyed by some predator, June 19.

1940 Nest 3

Three eggs laid June 23–25 measuring 18 × 15, 18 × 15, and 18.8 × 15 mm., disappeared June 26. Nest two feet (61 cm.) above ground in small maple stub 22 feet (7.1 m.) from nest 1.

1940 Nest 4

Found July 2 with two eggs measuring 18 × 15 and 17 × 14.8 mm., which had disappeared July 3. A House Wren had replaced nest with sticks. Nest in same bird house as nest 1.

Weights and Measurements

Newly hatched Prothonotary Warblers range in weight from 1.1 to 1.9 gm., averaging for 16 individuals 1.84 gm. When one week old they usually weighed more than 12 gm., but gained little more by the time they left the nest at ten or eleven days. Wings measured about 6 mm. at hatching and increased to 51 mm. at 11 days; tarsi from 5 to 19 mm.; exposed culmens from 3 to 9.5 mm.

Sixty-one adult females fom Michigan averaged 17.4 gm. (13.6–20.0) in weight; their wings averaged 68.9; exposed culmens, 13.77; tarsi, 18.44 mm. Of 18 males, the average weight was 14.95 (13.6–15.8) gm.; wings, 73.8 mm.; exposed culmens, 14.4; tarsi, 19.6. Wings were measured, unflattened, with a straight-edge ruler from the bend to the tip of the longest primary.

Summary

A nesting study of the Prothonotary Warbler (*Protonotaria citrea*) was made in Calhoun County, Michigan from 1937 to 1948. The study was made in a plot two-thirds of a mile long (1069 meters) and about 88 acres (35.62 hectares) in area, along the Battle Creek River.

Of 84 nests, 29 were over standing water, 32 over running water or its edge, and 23 over dry land. The latter were from .61 to 137.8 meters from the river bank. Of the 84 nests, 43 were in natural openings and 41 in woodpecker holes, usually those formerly used by the Downy Woodpecker. Forty-one nests were from 61 to 152 cm. above ground or water; 21 from 152 to 304, and 20 from 304 to 450; two nests were still higher, the highest being 10.4 meters above ground.

Males usually selected the first nest site and often carried moss into the opening before the arrival of the female. Battles over territory often lasted several days. A nest site was often selected and territory established around it.

In Michigan, an average of 14 pairs nested on the 88 acres from 1937 through 1943. In 1941, the average size of territory was 3.66 acres (148 ares) with extremes 1.9 and 6.38 acres (76.8 and 258 ares). Smallest were three territories each of about 1.9 acres.

Two males were studied in detail through five summers of nestings. One, 139–96601, had two nests 412 meters apart during 1942, but in the five summers occupied an area of about 9.46 acres (3.82 hectares). The other male, 40–29355, banded as a nestling, returned to use an area of about six acres during four summers, the average size per summer being about 3.16 acres (127.8 ares). A third male had a different territory for each of three summers while yet another had two that overlapped in different years, then a different one the third year. Females returned less often. One female lived at least five years, but was found during only four. She apparently had a new mate each summer as did the two males for which I have five-year records. The greatest distance between her nests of 1937, 1939, 1940, and 1941 was 2423 feet (732 meters).

During 10 summers the average date of arrival of the first male was May 4 (April 26–May 14); the average date of the first laid egg, May 18 (May 8–25); and the termination of the last nesting, July 8 (July 6–14). The average measurement of 297 eggs was 18.26 $\times$14.62 mm., and the average weight, 2.06 gm. The average number of eggs in 94 sets was 5.07 (3–7) and the average set weight, 10.45 gm. First sets of eggs are larger, as demonstrated earlier (Walkinshaw, 1941. *Wilson Bull.*, 53:10).

The female does the incubating, but at times is fed by the male. Usually she leaves the nest to receive food. During 376 minutes at a nest in 1948, the female incubated 303 minutes (80.6 per cent) of the time, in periods of from 39 to 66 minutes duration. Inattentive periods (19.4 per cent) varied from 7 to 19 minutes. The male usually sang less than 50 meters from the nest; 85 per cent of his perches were in the shade and were from 1.22 to 10.6 meters above the ground or water. Rates of singing in the early morning are 7 to 8 songs per minute; during mid-day, 1 to 4. The number of syllables varied from 7 to 12. In 1948, a total nesting census was made. Forty species of birds and 105 pairs nested on the 88 acres–a density of 119 pairs per 100 acres.

Male Prothonotary Warblers have been observed to chase all birds that came within a few feet of their nests. Near one nest Bronzed Grackles were scolded much more than other birds, and squirrels also were chased away.

On June 8, 1948, a male Prothonotary began to sing at 4:37 a.m. The female left the nest for the first time at 5:32 a.m. and the male made 17 trips with food to the newly hatched young while the female made three between 4:52 and 7:15 a.m. The female left the nest for four periods averaging 9.7 minutes (8–13) and remained on the nest an average of 18.6 minutes (15–23). On June 13, between 12:45 and 3:00 p.m., the female did not brood the young; the male fed ten times with an average of 10.4 minutes (2–28) between feedings; the female fed nine times and averaged 9.9 minutes between feedings (1–25).

Of 178 Michigan nests, 50 (28.1 per cent) were successful in that at least one young left the nest. Of 645 eggs, 262 (40.6 per cent) hatched and 191 (29.6 per cent) young left the nest. Two of 138 banded nestlings returned the next year. One returned one year; the other, five. In 11 years, 1937–1947, 58 adult females were banded. Based on returns, the average age of these birds was at least 1.86 years. Males were more faithful in returning to past years' territories. Eighteen were banded of which nine returned the first year, five the second, two the third, and two the fifth.

One pair of Prothonotaries nested twice in the same bird house in 1938 and once in 1939. The female mated with a new male during 1940. In three summers she was known to produce eight young from 22 eggs. One of these, a male, apparently had a different mate each year for five summers. His mates laid at least 32 eggs of which 16 hatched and 12 left their nests. Another male was observed for five summers and had a new mate each year. His mates were found to lay 26 eggs, hatching 16, and 10 young left the nest. A pilot black snake devoured five of their young.

During four summers I observed 21 eggs of one female which averaged 17.94 × 14.45 mm. in size and 1.93 gm. in weight. One summer her daughter, when one year old, laid 11 eggs averaging 17.8 × 14.8 mm. and 2.1 gm.

Newly hatched Prothonotaries range in weight from 1.1 to 1.9 gm. (average, 1.84 gm.). When they left the nest at 10 or 11 days of age they weighed over 12 gm. Sixty-one females averaged 17.44 gm. (13.6 to 20.0) in weight; 18 males averaged 14.9 (13.6 to 15.8) gm. Wings of the females averaged 68.9 mm.; exposed culmens, 13.8 mm.; tarsi, 18.4 mm. In the males, wings averaged 73.8; culmens, 14.4; and tarsi, 19.6 mm.

1703 Wolverine Tower, Battle Creek, Michigan, January 19, 1952

WOOD WARBLERS WINTERING IN CUBA

BY STEPHEN W. EATON

LITTLE is known concerning the winter behavior of the various species of North American wood warblers (Parulidae) which retire south of the United States in the fall. Are they sedentary or do they wander over broad geographic areas? What degree of sociality among individuals and species is present? Because of the abundance of warblers in Cuba during the winter this island is an ideal place to study these questions.

From December 23, 1948 to January 3, 1949 I was on the island of Cuba with Ernest P. Edwards and George E. Grube. We stayed at the Harvard University Tropical Station which is approximately ten kilometers northeast of Cienfuegos. Habitats typical of this locality were well described by Barbour (1922:16–17).

Much of the land in this area has been cleared of its native vegetation to make way for sugar cane and pasture. The areas still forested are located on limestone outcrops, along fresh and brackish water streams, and along fence rows. Because of the abundance of termites, fences are of live trees, principally *Bursura* sp. and *Gliricidia* sp. The winter fruits of these trees and their insect fauna attract many birds.

My primary objective was to study the winter habits of the Ovenbird (*Seiurus aurocapillus*), Northern Water-thrush (*Seiurus noveboracensis*), and Louisiana Water-thrush (*Seiurus motacilla*). Three areas of habitat typical for these birds were chosen for study. The Ovenbird was found in upland woods; the Northern Water-thrush in and adjacent to mangroves; and the Louisiana Water-thrush along wooded fresh-water streams. Notes were taken on all parulids as well as on other species. For the most part the wood warblers present in the region were species which also winter in extreme southern Florida and throughout the Greater and Lesser Antilles.

Individual and Specific Sociality

The warblers were found (1) singly, (2) in flocks of one species, or (3) in flocks of several species. Species tending to be solitary (category 1) were the Louisiana Water-thrush, Ovenbird, Northern Water-thrush, Swainson's Warbler (*Limnothlypis swainsonii*), and Cape May Warbler (*Dendroica tigrina*). The Ovenbird and Northern Water-thrush were sometimes seen near mixed flocks of other species but were usually encountered as single individuals. All of these are primarily terrestrial or semiaquatic feeders except the Cape May Warbler which was usually seen feeding singly about bromeliads or trees in flower. In the second category was the Palm Warbler (*Dendroica palmarum*). Flocks numbering up to ten individuals, usually feeding in open fields, were seen on several occasions. However, they were also found in other

TABLE 1

MIXED FLOCKS OF WARBLERS IN CUBA

	Mangroves		Upland Woods						Wooded Stream Border					
	Flock Number													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Black and White Warbler		1	1		1	1	2	1	1			1		
2. Parula Warbler	5	3	1	1	1	1		3			1	1		
3. Black-throated Blue Warbler					1	1	1		1	1	1	1	1	1
4. Prairie Warbler		1				1		1			1			1
5. Redstart	4	3	2		2	3	3	4		1	1	1	1	1
6. Tody	1	1	1	1	1									
7. Loggerhead Flycatcher		1				1	1							
8. Greater Antillean Pewee			2	1	1	3	2							
9. Cuban Vireo							2							
10. Yellow-throated Vireo						1	1							
11. Palm Warbler			1						1	1	1	1		
12. Ovenbird	1			1	1	2	2	1						
13. Northern Water-thrush	2	1												
Total individuals per flock	13	11	8	4	8	14	14	10						

Species 1 through 5 are considered "nucleus species" and 6 through 13 "circumference species." Circumference species in the wooded stream border were not recorded in my field notes.

types of habitat and were sometimes seen singly. They were seldom found in mixed species flocks. The Yellow-throat (*Geothlypis trichas*) was often seen in loose aggregations but never in relatively compact flocks as was the Palm Warbler which fed in open fields and at the borders of fields. Flocks of several species (category 3) usually included the Black and White Warbler (*Mniotilta varia*), Parula Warbler (*Parula americana*), Black-throated Blue Warbler (*Dendroica caerulescens*), Prairie Warbler (*Dendroica discolor*), and the Redstart (*Setophaga ruticilla*). These aggregations were encountered in all three study areas (see Table 1). The mixed species flocks of winter birds, familiar in the northern United States, variously composed of chickadees, nuthatches, woodpeckers, kinglets, and brown creepers, seemed to be paralleled here by these wintering warblers. The groups moved gradually through the woods, each species of the flock feeding in its own fashion within fairly consistent altitudinal limits. Black and White Warblers searched for food hidden in the tree trunks; Parula, Yellow-throated, and Prairie Warblers hunted the tops and central areas of the trees; Black-throated Blue Warblers fed mainly close to the ground; and Redstarts fluttered from ground to tree-top after flying insects. Indigenous species sometimes associated with these flocks, particularly in the upland woods, were the Cuban Tody (*Todus multicolor*), Loggerhead Flycatcher (*Tolmarchus caudifasciatus*), Greater Antillean Pewee (*Contopus caribaeus*), and the Cuban Vireo (*Vireo gundlachii*).

On three occasions I heard excited chipping from some or all of the species in these flocks which seemed to indicate they were in close communication with one another. Two of these incidents occurred after I shot a member of such a group. A third seemed to start spontaneously, all members of the mixed group beginning to chip excitedly. The cause of the excitement was never discovered. I looked hard for a Cuban Pygmy Owl (*Glaucidium siju*), known to occur locally, or some other predator but never succeeded in locating one.

Territoriality

Most of the solitary warblers seemed to remain within rather well circumscribed areas. An Ovenbird, assumed to be the same individual, could always be found in an open greenhouse within the confines of the Tropical Station. However, none of the warblers studied, except the Louisiana Water-thrush showed obvious territorial tendencies. This species appeared to be established in distinct feeding areas along fresh water streams. Ten individuals occurred over a distance of about one kilometer along a stream. On three occasions I visited this area and each time Louisiana Water-thrushes were seen in the same locations along the stream. As I walked up the stream one bird would flush from the bank and fly upstream approximately 100 meters in two or three short flights. Then the bird would fly around me downstream or engage

in a fight with another Water-thrush. These fights, of which three were seen, were brief encounters involving a flashing of wings and short aerial chases. Before and during these engagements chipping was loud and frequent and was followed by a "sputtering" sound from one or both of the birds. This behavior pattern suggested somewhat the defense of territory by the male on the breeding grounds (Eaton, 1949). The last day I visited this area I was able to collect five of these birds all of which proved to be males.

Miscellaneous Observations

The Black and White Warbler was the only species of warbler heard singing and was heard only twice during intraspecific fighting. It was interesting to note the presence of vertebrate bones in warbler stomachs. Bones of small amphibians were found in stomachs of the Louisiana Water-thrush and bones of small lizards in stomachs of Swainson's Warbler, Worm-eating Warbler (*Helmitheros vermivorus*), and Ovenbird.

Discussion

The solitary species were more sedentary and restricted in their choice of feeding areas than the species in mixed flocks. The Ovenbird fed on the ground but hopped up into the tree canopy to seek shelter. The Northern Water-thrush fed on the ground and along edges of pools but when disturbed flew into the dense tangles of mangroves. These essentially solitary individuals became loosely associated with mixed flocks only when seeking cover. Louisiana Water-thrushes were never seen with mixed species flocks. They seldom left the stream border. These three species range in weight from 15 to 21 grams in contrast to members of mixed flocks which range from 7 to 11 grams. The Cape May Warbler, the last of the normally solitary warblers here considered, was usually seen near flowers, which at this season were not generally distributed. This fact may explain why the Cape May seldom wanders with mixed flocks.

The Palm Warbler was considered by Todd (1940:534) to be sparrow-like in its haunts and habits, particularly in the fall. Trautman (1940:365) said (Ohio): "The bird habitually flocked by itself in a brushy thicket of less than an acre in extent. . . ." Palmer (1949:483) said it was gregarious and social in the fall and often accompanied other warblers as well as juncos. This gregariousness seemed to be maintained into the winter in Cuba—a unique habit for a member of this family. This inclination of the species to feed in open areas may well account for the single species flock. A parallel may be drawn here to pure flocks of juncos, Tree Sparrows (*Spizella arborea*), and blackbirds which feed in open areas during the non-breeding season. Allee (1938) mentions examples from other groups: including the grouping of foreigners

in a strange city, the schooling of fish in a clean aquarium, and the flocking tendency of mammals on the grassy plains of the temperate zones.

Chapin (1932:220–224) wrote of mixed flocks in the Belgian Congo and spoke of their presence there at all seasons. Winterbottom (1949:258) suggested that species of woodland bird parties of Northern Rhodesia fall into two categories: "nucleus" species, always found in parties; and "circumference" species which formed mixed parties by attaching themselves to groups of nucleus species. Davis (1946:tables II and III) classified birds, in mixed flocks in Brazilian forest, as regular or accidental in respect to their membership in the flocks. The mixed flocks of warblers I saw in wooded habitat in Cuba seemed to suggest similar associations. Nucleus species appeared to be the Black and White Warbler, Parula Warbler, Prairie Warbler, Black-throated Blue Warbler, and Redstart. Redstarts and Parula Warblers were represented in flocks by from two to five individuals—other nucleus species usually by one individual. Circumference species included the Ovenbird, Northern Water-thrush (in mangroves), Cuban Tody, Loggerhead Flycatcher, Greater Antillean Pewee, Cuban Vireo, and Yellow-throated Vireo (*Vireo flavifrons*). It must be remembered that my data merely suggest these categories and further work should be done before further generalizations are made.

The sedentary habits of wintering warblers have been previously observed. Wetmore (1943:318) wrote of a Redstart which fed in a very restricted area near his camp in Veracruz. The Louisiana Water-thrushes which I observed in Cuba had feeding territories which averaged 100 meters in length—approximately one quarter the length of the average breeding territory (Eaton, 1949). Another species which frequents the borders of streams shows a similar type of feeding territory. Bent (1948:109), writing of the Dipper (*Cinclus mexicanus*), said that even though the territories are shorter in winter, they seem to be fairly well maintained.

Summary

North American warblers wintering in Cuba are either solitary or occur in flocks of one or several species. Large ground-feeding species and species which habitually feed near flowering plants usually occur as solitary individuals. Species feeding in open fields tend to occur in pure flocks. Mixed aggregations usually consist of small species which feed within canopies of heavily wooded areas. Perhaps these flocks have some survival value. They appear to be counterparts of Winterbottom's "nucleus" and "circumference" species.

The solitary warblers seemed to be sedentary but the only species seen actively defending a feeding area was the Louisiana Water-thrush.

Literature Cited

Allee, W. C.
1938 The social life of animals. New York. W. W. Norton and Company.
Barbour, T.
1922 The birds of Cuba. *Mem. Nutt. Orn. Club,* No. 6:141 pp.
Bent, A. C.
1948 Life histories of North American nuthatches, wrens, thrashers and their allies. *U. S. Natl. Mus. Bull.* 195:435 pp.
Chapin, J. P.
1932 The birds of the Belgian Congo. *Bull. Amer. Mus. Nat. Hist.,* 65:756 pp.
Davis, D. E.
1946 A seasonal analysis of mixed flocks of birds in Brazil. *Ecology,* 27:168–181.
Eaton, S. W.
1949ms. A comparative study of the Genus *Seiurus.* Cornell University, unpubl. Ph.D. thesis.
Palmer, R. S.
1949 Maine birds. *Buli. Mus. Comp. Zool.,* 102:656 pp.
Todd, W. E. C.
1940 Birds of western Pennsylvania. Pittsburgh. University of Pittsburgh Press.
Trautman, M. B.
1940 The birds of Buckeye Lake, Ohio. *Univ. Mich. Mus. Zool., Misc. Publ.,* No. 44:466 pp.
Wetmore, A.
1943 The birds of southern Veracruz, Mexico. *Proc. U. S. Natl. Mus.,* 93:215–340.
Winterbottom, J. M.
1949 Mixed bird parties in the tropics, with special reference to northern Rhodesia. *Auk,* 66:258–263.

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WINTER DISTRIBUTION OF ROBINS EAST OF THE ROCKY MOUNTAINS[1]

BY J. MURRAY SPEIRS[2]

Distribution during December, January, and February

MUCH has been written dealing with the distribution of American Robins (*Turdus migratorius*) during the winter months, mostly from the point of view of specific occurrences at given localities. Robins have been recorded wintering from St. Johns, Newfoundland, in the northeast, to Winnipeg, Manitoba, in the northwest, and south into Mexico.

Cooke (1884) gave a very good account of Robin distribution during one winter. He stated: "During the larger part of the month of January the bulk of the Robins, and probably even ninety-five to ninety-seven per cent, were south of the parallel of 37°. This is south of the usual limit, the northern boundary for ordinary winters being 39°."

The A.O.U. Check-List (1931:255–256), apparently following Cooke in regard to the northern boundary, states that the Robin "Winters from central Kansas, Ohio Valley, and eastern Massachusetts (irregular farther north) to the Gulf coast and southern Florida, and to Nuevo Leon, Mexico."

Several authors have shown that Robins occur quite regularly in many localities north of the Cooke-A.O.U. boundary, from Nova Scotia in the east to northern Minnesota in the west (Lewis, 1919; Roberts, 1932:112–113).

The most northerly winter records of Robins I have found in the literature and from correspondence include Winnipeg, Manitoba (Cartwright); Fort Frances, Ontario (Robertson); Port Arthur, Ontario (Allin); Ottawa, Ontario (Eifrig); Point des Monts, Quebec (Comeau); and St. Johns, Newfoundland (Hawley). Robins winter regularly in small numbers as far north as the lower Great Lakes, and large numbers have occasionally been reported in winter from Duluth, Minnesota, and from Cleveland, Ohio.

Brooks (1934) published a map showing for each state and province (1) the number of Christmas bird censuses which had been made during the previous 34 years, (2) the number of censuses on which Robins were seen, and (3) the number of individual Robins seen. This map shows that, in the 34-year period, some Robins had been reported from every state east of the Rocky Mountains (except Vermont) and from the provinces of Ontario and Quebec.

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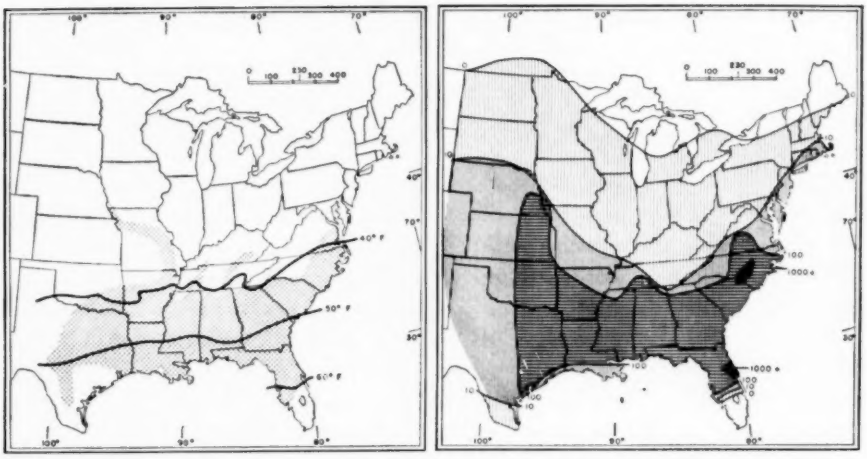
[1] Contribution from the Zoological Laboratory of the University of Illinois.

[2] I wish to thank Mr. Frederick C. Lincoln, who kindly gave access to the banding records of Robins in the files of the Fish and Wildlife Service; Dr. S. Charles Kendeigh and Dr. Josselyn Van Tyne for their constructive suggestions and careful reading of the manuscript; and Doris H. Speirs for her encouragement and ready assistance at all times.



MAP 1 (left). Winter range of Robins as indicated by banding recoveries (but see also Map 2). The crosshatched area includes localities from which banded Robins have been recovered in December, January, and February. The heavy lines indicate the average positions of the 40°F, 50°F. and 60°F isotherms for January (Kincer, 1928). The December and February isotherms are slightly farther north.

MAP 2 (right). Relative density of Robin populations in late December. The degree of shading indicates the density of Robin populations in late December, as indicated by Christmas censuses taken in 1938, 1939, and 1940. No Robins were reported on censuses taken north of the upper line; less than 10 Robins per census party were observed in the most lightly shaded area between the two upper lines; between 10 and 100 Robins per census party were reported in the next most heavily shaded area; over a hundred Robins per census party were reported in the area indicated by cross hatching; the darkest areas indicate regions where over a thousand Robins per census party were reported.

On September 13 and 14, 1940, Doris H. Speirs and the writer were given access to the Robin banding records in the files of the U. S. Biological Survey (now U. S. Fish and Wildlife Service) at Washington. We listed all records for Robins recovered at localities more than 50 miles distant from the station where they were originally banded, for all states and provinces east of the Rocky Mountains. Maps similar to Maps 4, 5, and 6 have been prepared for each of these states and provinces, showing corresponding points of banding and recovery.

Map 1 shows the 348 localities where 405 banded Robins were recovered during the months of December, January, and February. One locality is not shown (a Robin was recovered in December at Pachuca, Hidalgo, Mexico—about 800 miles south of San Antonio, Texas). Most of the winter recoveries have been in the Gulf States and the Atlantic Coast States from Florida to North Carolina. Actually 79 per cent of the recoveries have been from the Gulf States and 99 per cent have been south of 37° N. latitude.

Map 2 summarizes the Robin population data from the 1938, 1939, and 1940 "Christmas censuses" published in *Bird-Lore* and the *Canadian Field-Naturalist*. A comparison of Maps 1 and 2 will show that the area in which banded Robins were recovered in winter corresponds fairly closely with the area in which densities of more than one hundred Robins per census party were reported.

Maps 1 and 2 indicate that the area of greatest abundance in winter lies between the latitudes of 30° and 35° N. latitude, with extensions northward into eastern North Carolina and central Tennessee, and southward into the peninsula of Florida and into the wooded regions in southeastern Texas. It will be seen that this excludes the southern tip of Florida, southern Texas, northern Mexico, and from the Ohio Valley to eastern Massachusetts, all of which are included in the winter range as defined in the A.O.U. Check-List. From Map 2 it will be seen that there is a population of Robins north of the region of greatest abundance until at least as late as the Christmas season.

Relationship between Winter Distribution and Temperature

Allard (1928:390) remarks: "It is said [by Cooke, 1904:384–385] that the Robin's migratory movements are determined by a temperature of 35° Fahrenheit yet something makes him quietly forget this so-called determining point in the south throughout the winter." Eifrig (1922:92) wrote that during the mild winter of 1920–21 "there were more Meadowlarks and Robins remaining all winter a few miles south [of Chicago] than usual, but nothing striking." Forbush (1923) wrote: "Robins . . . survived temperatures of 40 below zero" in New England during the winter of 1922–23. Jones (1923) said, "the mild winter . . . made it possible for many birds [including Robins] to spend the winter [1921–22, 1922–23] well north of their usual range." Roads (1930) noted that the Robins were "unusually common" during the open winter of 1928–29 at Hillsboro, Ohio.

Allard's criticism of Cooke's 35° "determining point" is an indirect criticism of Cooke's use of "arrival" dates to represent the time of migration of the species. Cooke was dealing with the earliest birds noted in spring and the latest noted in autumn, whereas Allard was referring to the bulk of the Robin population. Several of the authors quoted above imply that appreciable numbers of Robins occur in the northern states only during unusually mild, or open, winters, whereas Forbush showed that some Robins can survive very low temperatures.

From Map 1 it will be seen that the majority of the winter recoveries of banded Robins have been made in the region lying between the average positions of the 40° F and the 60° F January isotherms. Actually, only about

6 per cent of the winter recoveries occurred in regions north or south of these isotherms.

The 40° F isotherm for January corresponds well with the northern boundary of the region in which less than 15 days per winter have continuously freezing temperatures. In this region it is to be expected that, generally, Robins would be able to find unfrozen ground and a supply of animal food. Temperature, however, is not the only factor important in determining the winter distribution of Robins, as is indicated by the comparative scarcity of Robins in western and southern Texas, much of which lies between the 40° F and 60° F isotherms in January.

Winter Distribution and Ecological Relationships

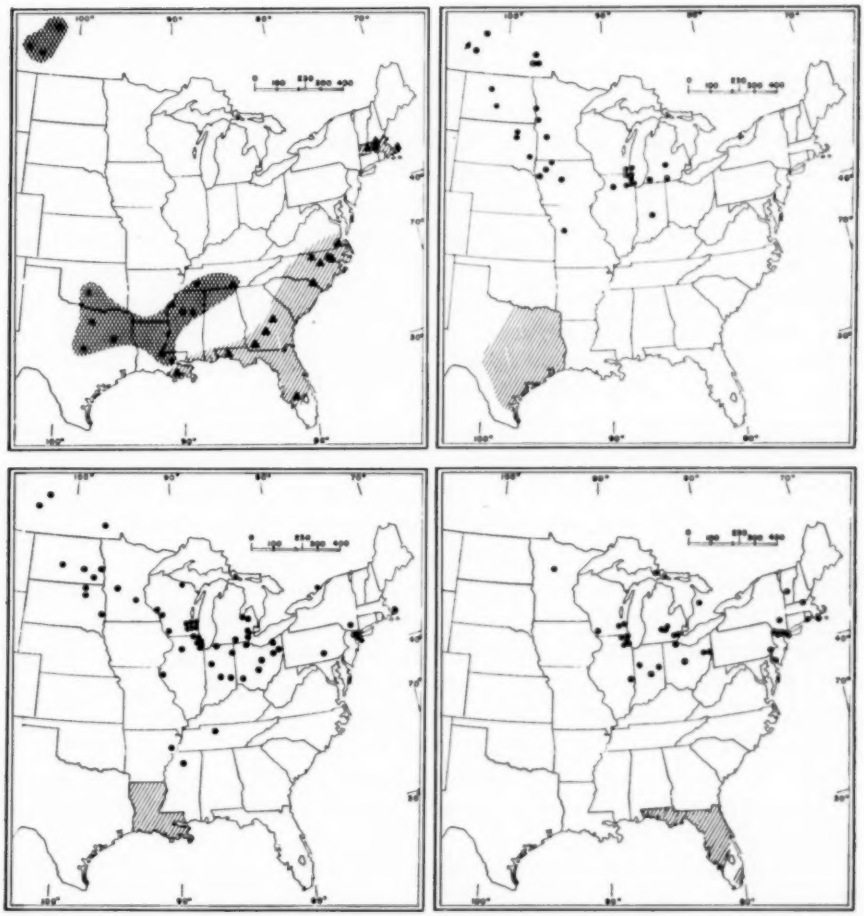
An abundant literature has dealt with the kinds of berries eaten by Robins at different localities in winter, with the importance of fresh water as well as food, with the types of roost cover (mostly low, dense growth), and to some extent with the general habitat type in particular localities. For details see Black (1932); Corrington (1922); Fargo (1926, 1928); Forbush (1925, 1929: 408); Ganier (1924); Gardner (1933); Hicks (1934); A. H. Howell (1932); Hunt (1921); Larson (1928:110); Lewis (1919); May (1924); McIlhenny (1936, 1940); Miller (1922); Nuttall (1832:338) and Stone (1937:768–773). Cooke (1884:106) stressed the importance of food as a factor in the winter distribution, while Howell (1940, MS) pointed out that insects as well as wild fruits were important as Robin food, particularly in the late winter.

The region in which Robins are most abundant in winter (as shown in Maps 1 and 2) corresponds very closely with the oak-pine and the pine associes of the deciduous forest biome. Even the outlying recoveries shown in Map 1 occurred in wooded areas. The lack of recoveries from the mesquite areas of southern Texas, from the prairies of western Texas, and from the coastal grasslands of Texas and southern Florida indicates that forested areas as well as favorable temperatures are winter habitat requirements.

Observers in the Southern States have found Robin roosts in such evergreens as camphor trees, junipers, bay, gallberry, small pines, cane, cedar, and magnolias. The tendency of Robins to winter in the pine and oak-pine associes, rather than the surrounding regions, may be due to the abundance of good roosting cover in these associes as much as to the greater prevalence and variety of food, though the latter has hitherto been stressed in the literature.

Latitudinal Relationship of Winter and Breeding Distributions

Cooke (1904:374) wrote: "Probably no individual robin is a continuous resident in any section; but the robin that nests, let us say, in southern Mis-



MAP 3 (upper left). Winter recoveries of Robins banded in Saskatchewan (11 birds banded between March 29 and July 23) and in Massachusetts (12 birds banded between April 22 and October 21).

MAP 4 (upper right). Place of banding of 58 Robins (banded during the summer season) recovered in Texas in winter.

MAP 5 (lower left). Place of banding of 116 Robins (banded during the summer season) recovered in Louisiana in winter.

MAP 6 (lower right). Place of banding of 60 Robins (banded during the summer season) recovered in Florida in winter.

souri, will spend the winter near the Gulf, while his hardy Canada-bred cousin will be the winter tenant of the abandoned summer home of the southern bird." This concept of a hardy population of Robins from the north coming

south in autumn and displacing the summer residents which then go still farther south to winter has been widely accepted (Forbush, 1929: 408, and Lincoln, 1939:69).

The following analysis of banding data does not support this view. Of 273 Robins banded north of 40° N., the average latitude of winter recovery was 32.0° N. For the 51 of these Robins banded north of 45° N., the average latitude of winter recovery was 31.9° N. For the 17 banded north of 48° N., the average latitude of winter recovery was 32.1° N.

For 46 Robins banded at stations south of 40° N., the average latitude of winter recovery was 32.2° N. For the six of these banded south of 37° N., the average latitude of winter recovery was 33.0° N. These data show a tendency for Robins from all latitudes of their breeding range to winter in about the same average latitude (32° N.). The only tendency to deviate from this, shown by the above analysis, is for the Robins breeding in the most southerly latitudes to winter slightly farther north than those breeding in the north. However, the data for the south are too scanty to more than suggest this tendency at present. The following additional cases may be cited as evidence against Cooke's displacement theory.

An immature Robin, banded at Nashville, Tennessee (36.1° N) by Amelia R. Laskey on June 11, 1936, was found dead at Mt. Juliet, Tennessee (about 15 miles east of Nashville), the following February 14, 1937. Laskey (1947) also reported on a pair of color-banded Robins which nested in her garden at Nashville in July, 1945, and wintered there from December 27, 1945, to March 24, 1946, when the male was killed by a dog.

One Robin was banded at Auburn, Alabama (32.6° N.) on March 6, 1931, and recovered in winter *farther north* than this, at Guntersville, Alabama (34.4° N.) on February 1, 1934. Incidentally, so far as I am aware, this is the farthest south that a Robin has been banded and later recovered more than 50 miles from the banding station.

Longitudinal Relationships of Winter and Breeding Distributions

Several writers have analysed the winter recoveries of Robins banded in particular localities or states: *e.g.*, Beals and Nichols (1940); Brooks (1931: 27); Commons (1938:231); Howell (1940, MS); and Lincoln (1939:134–135). Howell (1940, MS) pointed out the tendency for most of the Robins from Illinois and Iowa to winter directly south of these states, whereas the Massachusetts population wintered mainly in the Atlantic coast states and the Saskatchewan population, mainly in the Gulf coast states. The analyses have generally shown a wide spread in the winter recoveries of Robins which had been banded in relatively small areas, though the majority of the recoveries have been from almost directly south. Exceptions are far eastern birds forced

westward by the Atlantic and far western birds deflected eastward by the prairie. These findings have been corroborated and extended by my study.

Map 3 shows that the bulk of the Saskatchewan Robins winter considerably farther west than the bulk of the Massachusetts Robins, although there is a large overlap in the longitudes of the recoveries from the two regions.

Maps 4, 5, and 6 show that most of the Robins wintering in Texas come from the west, that most of the Robins wintering in Florida come from the east, and that most of the Robins wintering in Louisiana come from the central part of the country. No Robins from the far east have been recovered in Texas, and no Robins from the far west have been recovered in Florida, but Robins from the central area have wintered to some extent in both: and Robins from both far east and far west have wintered in the central south (Louisiana).

Summary and Conclusions

Analyses of the winter recoveries of banded Robins and of Christmas bird counts indicate that the area in which Robins are most abundant in winter lies between the latitudes 30° N. and 35° N., and extends northward into eastern North Carolina and central Tennessee; southward it includes the peninsula of Florida (north of the everglades) and the wooded regions of southeastern Texas. This winter range differs from that given in the A.O.U. Check-List (1931) in excluding, in the south, the southern tip of Florida, southern Texas, and northern Mexico and, in the north, the Ohio Valley to eastern Massachusetts. The status of the Robin north of this area of greatest abundance is indicated.

Banding evidence indicates that 94 per cent of the Robin population winters between the 40° F. and the 60° F. isotherms. Robins are most abundant in winter in the pine and oak-pine associes of the deciduous forest biome. They decrease in abundance in non-forested or poorly forested areas westward.

Most northern Robins winter in the same latitudes as Robins raised in the south. Robins breeding in the east tend to winter farther east than Robins breeding in the west, but some overlapping occurs.

Literature Cited

Allard, H. A.
1928 Bird migration from the point of view of light and length of day changes. *Amer. Nat.*, 62:385–408.

American Ornithologists' Union
1931 Check-list of North American birds. Lancaster, Pa.

Beals, M. V., and J. T. Nichols
1940 Data from a bird-banding station at Elmhurst, Long Island. *Birds of Long Island* No. 3:57–76.

BLACK, J. D.
1932 A winter Robin roost in Arkansas. *Wils. Bull.*, 44:13–19.

BROOKS, E.
1931 "Robin notes." *Indiana Audubon Year Book for 1931*:17–29.
1934 "Winter distribution of Robins." *Indiana Audubon Year Book for 1934*:60–62.

COMMONS, M. A.
1938 The log of Tanager Hill. Waverly Press, Baltimore.

COOKE, W. W.
1884 Migration in the Mississippi Valley. *Ornith. and Ool.*, 9:105–108. (Note is unsigned but is attributed to Cooke in the index to the volume.)
1904 Some new facts about the migration of birds. *Yearbook U. S. Dept. Agric. for 1903*:371–386.

CORRINGTON, J. D.
1922 The winter birds of the Biloxi, Mississippi region. *Auk.*, 39:530–556.

EIFRIG, C. W. G.
1922 A mild winter and its effects on the migration of birds at Chicago. *Wils. Bull.*, 34:90–94.

FARGO, W. G.
1926 Notes on birds of Pinellas and Pasco counties, Florida. *Wils. Bull.*, 38:140–155.
1928 Banding Robins in Florida. *Wils. Bull.*, 40:198.

FORBUSH, E. H.
1923 Items of Interest, No. 24:1.
1925 Items of Interest, No. 47:1.
1929 Birds of Massachusetts and other New England States (Vol. 3.). Norwood Press, Norwood, Mass.

GANIER, A. F.
1924 Starlings abundant at Nashville, Tenn. *Wils. Bull.*, 36:31–32.

GARDNER, J. H.
1933 Excessive cold in winter drives Robins and Waxwings south. *Bird-Lore*, 35: 156.

HICKS, L. E.
1934 Winter birds of the Mississippi Gulf Coast. *Wils. Bull.*, 46:259–260.

HOWELL, A. H.
1932 Florida bird life. Fla. Dept. Game and Fresh Water Fish.

HOWELL, J. C.
1940, MS A study of the American Robin. Cornell Univ. Ph.D. Thesis, unpubl.

HUDSON, G. E., AND F. SHERMAN
1936 Some miscellaneous notes on South Carolina birds. *Auk*, 53:311–315.

HUNT, C. J.
1921 Notes on the winter and early spring birds of southeastern Arkansas. *Auk*, 38:370–381.

JONES, L.
1923 Some migration notes from Oberlin, Ohio. *Wils. Bull.*, 35:59.

KINCER, J. B.
1928 Atlas of American agriculture. Part II. Climate. Section B. Temperature, sunshine, wind. U. S. Govt. Printing Office, Washington, D.C.

LARSON, A.
1928 Birds of eastern McKenzie County, North Dakota. *Wils. Bull.*, 40:100–110.
LASKEY, A. R.
1947 Further data on a one-eyed Robin. *Bird-Banding*, 18:31.
LEWIS, H. F.
1919 Winter Robins in Nova Scotia. *Auk*, 36:205–217.
LINCOLN, F. C.
1939 The migration of American birds. Doubleday, Doran & Company, Inc., New York.
MCILHENNY, E. A.
1936 Are starlings a menace to the food supply of our native birds? *Auk*, 53:338–339.
1940 Effect of excessive cold on birds in southern Louisiana. *Auk*, 57:408–410.
MAY, J. B.
1924 Bird banding at Thomasville, Georgia, 1924. *Auk*, 41:451–462.
MILLER, C. E.
1922 Mockingbird in Maine. *Auk*, 39:115–116.
NUTTALL, T.
1832 A manual of the ornithology of the United States and Canada. The land birds. Hilliard and Brown, Cambridge.
ROADS, K. M.
1930 An unusual number of wintering birds at Hillsboro, Ohio. *Wils. Bull.*, 42:214.
ROBERTS, T. S.
1932 The birds of Minnesota (vol. 2). University of Minnesota Press, Minneapolis.
STONE, W.
1937 Bird studies at old Cape May (vol. 2). Delaware Valley Ornith. Club, Acad. Nat. Sci. Philadelphia.
TAYLOR, W.
1923 January notes from Madison, Wis. *Wils. Bull.*, 35:54–55.

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EFFECT OF WEATHER ON SPRING BIRD MIGRATION IN NORTHERN ALABAMA

BY THOMAS A. IMHOF

IN VIEW of current interest in trans-Gulf migration, I herewith present the results of a four-year study (1947–1950) of the correlation of spring bird movement with weather at Birmingham, Alabama. In a large area of the Gulf States of Texas, Louisiana, Mississippi, Alabama, and Florida, true transient birds are notably scarce in spring (Lowery, 1946; Williams, 1950a and 1950b; and others). This study covers all night-migrating land birds that winter south of the Rio Grande and that breed east of the Mississippi but not within five miles of the place where I made observations. These 28 species are listed in Tables 1 and 2 and will be referred to in this paper as true transients.

True transients are generally recorded on the Gulf Coast only in weather associated with the passage of a cold front (Burleigh, 1944:9–10; Lowery, 1945:95–96; and others). However, at Birmingham, 220 miles inland, conditions are different. It is my hope that the differences as brought out by this study will increase our understanding of spring migration in the Gulf area.

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METHODS

Within the periods March 1 to June 1 inclusive, in the four years of the study, I was afield on 130 days, averaging 32.5 days per spring period (93 days). Trips afield varied from one-half hour to 10 hours and averaged 2.15 hours. All daylight hours were included with most coverage between 6 and 9 a.m. Habitat coverage was approximately as follows: oak-pine woodland (65% hardwoods, 35% pine), 80%; lake shore, 8%; suburban residential areas developed from oak-pine woodland, 5%; farmland, including fallow fields mostly in broomsedge and aster, 3%; cattail marsh, 3%; and open short-grass airport, 1%. Numbers of species and individuals of true transients observed were recorded and correlated with weather data from the Birmingham station (U. S. Dept. Commerce, Weather Bureau, W.R.P.C., Chattanooga, Tenn., 1947-1950).

Detailed graphs were made showing a norm line based on more than 55 years of weather observations with adverse weather charted below this line and favorable weather above. Elements considered were wind direction and velocity, sky cover, precipitation, and departure from the normal temperature. These detailed graphs for March, April, and May, 1947 to 1950, are the bases for Tables 1, 2, and 3. Five weather factors were considered: *cold front, adverse* (north) *wind, south wind, rain alone* (*i.e.,* in absence of a front), and *clear, warm* weather. The frequency of occurrence of each factor is shown in Table 3, Column 1, covering the period when true transients were recorded (see footnote to Table 3).

A rather even sample of weather adverse due to one or another of the causes listed was obtained, as shown in Table 3, Column 2. Anyone afield at Birmingham notices that true transients are scarce in clear, warm weather. This is a characteristic of the Gulf Coast hiatus (Williams, 1950b:182)—hence I was seldom afield in such weather. However, I obtained sufficient data to show that the number of true transients seen per day under such conditions is considerably lower than during adverse conditions (see Table 3, Column 7).

In other words it should be understood that adverse weather, as here used, means weather adverse to migration of birds (*i.e.,* favorable for observation of grounded migrants), while favorable weather (*clear, warm* and to a lesser extent, *south wind*), being good for migration of true transients, is unfavorable for observation and results in few such birds being seen.

Weather Principles

The U. S. Weather Bureau, on the reverse side of its daily weather map for Monday of each week, states:

> The boundary between two different air masses is called a front. Important changes in weather and temperature often occur with the passage of a front . . . The boundary of relatively cold air of polar origin advancing into an area occupied by warmer air, often of tropical origin, is called a cold front. The boundary of relatively warm air advancing into an area occupied by colder air is called a warm front. A boundary between two air masses, which shows little tendency at the time of observation to advance into either the warm or the cold areas, is called a stationary front. Air mass boundaries are known as surface fronts when they intersect the ground, and as upper air fronts when they do not.

Winds in the northern hemisphere rotate clockwise around a high pressure area and counterclockwise around a low pressure area. The typical cold front has a low pressure area at its eastern or northern end. Hence winds in the warm sector are southwesterly, passing counterclockwise around the eastern end of the low and usually producing a warm front. On the western side of the low, this counterclockwise rotation produces a NW wind which pushes

TABLE 1

WEATHER AT BIRMINGHAM IN SPRING IN RELATION TO MIGRANTS BREEDING NORTH OF ALABAMA

*Species**	*Winter Range†*	*Main Flyway†*	*No. of migrants seen with each weather factor. (Column A, no. of records; Column B, no. of individuals.)*											
			Cold Front		Adverse Wind		South Wind		Rain Alone		Clear Warm		Total	
			A	B	A	B	A	B	A	B	A	B	A	B
Chestnut-s. Warbler	CA	M,A	4	4	3	15	1	2	3	16	1	1	12	38
Bobolink	SA	A	2	247	4	30	1	2	3	3			10	282
Bay-br. Warbler	SA	A	3	8	3	23	2	12	2	3			10	46
Black-poll Warbler	SA	A	2	17	2	5	2	11	3	33			9	66
Blackburnian Warbler	SA	A	2	2			2	5	4	5	1	1	9	13
Olive-b. Thrush	CA&SA	M,A	2	8			3	5	3	9			8	22
Rose-br. Grosbeak	CA&SA	M,A	2	3	1	1	2	10	2	3			7	17
Veery	SA	M,A	1	2	1	1	2	7	2	6	1	1	7	17
Tennessee Warbler	CA&SA	M	2	3	1	4	1	1	2	9			6	17
Magnolia Warbler	WI&CA	M,A	2	5	2	6			2	3			6	14
Gray-cheeked Thrush	SA	M,A	1	3	1	2	1	1	1	2			4	8
Golden-w. Warbler	CA	M	1	1			3	5					4	6
Cape May Warbler	WI	A	1	1			1	1	2	3			4	5
Black-billed Cuckoo	SA	A					1	1	1	2			2	3
Philadelphia Vireo	CA	M,A	1	1									1	1
Least Flycatcher	CA	A			1	1							1	1
16 species			26	305	19	88	22	63	30	97	3	3	100	556

* Spring records of others: Olive-sided Flycatcher (*Nuttallornis borealis*), SA; Nashville Warbler (*Vermivora ruficapilla*), CA; Black-throated Blue Warbler (*Dendroica caerulescens*), WI, A; Northern Water-thrush (*Seiurus novaboracensis*), WI, A; Connecticut Warbler (*Oporornis agilis*), SA; Mourning Warbler (*Oporornis philadelphia*), CA& SA, M; Wilson's Warbler (*Wilsonia pusilla*), CA; and Canada Warbler (*Wilsonia canadensis*), SA.

† Peterson, 1947

the cold air southeastward and invades the warm sector (U. S. Dept. Agriculture Yearbook, 1941). This explains the wind shift from SW to NW when the

TABLE 2

WEATHER AT BIRMINGHAM IN SPRING IN RELATION TO MIGRANTS BREEDING IN ALABAMA BUT NOT NEAR THE SITE OF OBSERVATION

Species*	Winter Range†	Main Flyway†	No. of migrants seen with each weather factor. (Column A, no. of records; Column B, no. of individuals.)											
			Cold Front		Adverse Wind		South Wind		Rain Alone		Clear Warm		Total	
			A	B	A	B	A	B	A	B	A	B	A	B
Black and White Warbler	US	M,A	9	27	3	7	5	13	8	16	1	4	26	67
Cerulean Warbler	SA	M	7	15	2	2	4	25	4	7			17	49
Ovenbird	US	A	5	10	3	13	3	11	6	7			17	41
Scarlet Tanager	SA	M,A	3	11	4	6	4	26	4	23	1	1	16	67
Am. Redstart	WI, CA, SA	M,A	3	6	3	9	4	5	3	4	1	1	13	24
Black-thr. Gr. Warbler	CA	M,A	3	6	3	3	3	3	2	3			11	15
Eastern Kingbird	CA&SA	M,A	3	28	1	14	3	10			1	4	8	56
Worm-eating Warbler	WI&CA	M,A	2	4			2	5	2	3			6	12
Blue-winged Warbler	CA	M,A	1	1	1	1	1	1	1	1			4	4
Parula Warbler	US	M,A	1	1	1	1	2	2					4	4
Yellow-thr. Warbler	WI	A	1	2	1	3	1	1					3	6
La. Water-Thrush	CA&WI	A	1	1	1	1							2	2
12 species			39	112	23	60	32	102	30	64	3	9	127	347

* Spring records of others: Warbling Vireo (*Vireo gilvus*), CA, breeds rarely in nw Ala.; and Baltimore Oriole (*Icterus galbula*), CA&SA, breeds or bred rarely in n. Ala.
† Peterson, 1947.

typical cold front approaches from the northwest (see Figs. 1 and 2). This invasion of cold air generally blocks migrating birds in spring.

CORRELATION OF MIGRATION WITH WEATHER

Cold Front.—Because nearly all lows and highs pass north of Birmingham, winds there shift clockwise (veer) completely around the compass, producing a typical weather cycle lasting usually from two to ten days. Starting with a SW wind, we find that this brings in the warm, moist, light air from the Gulf of Mexico, resulting in cloudy weather and rain. Then comes the *cold*

front behind which is a wedge of heavy, cold, dry air which forces the lighter Gulf air mass to rise and to precipitate its moisture. The wind shifts immediately to NW, skies eventually clear, and it becomes cold. The attendant low pressure area moves eastward or northeastward and, as the cold air mass behind the front invades the warm sector, migrating birds encounter cloudiness, rain, then clearing, with a head wind and lower temperatures.

Occluded and stationary fronts were considered cold fronts when the wind shifted to northwesterly, although, due to their nature, they were much milder in action.

Typical of 16 observations of migration following a *cold front* is that of May 2, 1949. On May 1, the wind averaged SSE, almost 13 m.p.h., the temperature averaged 5° F. above normal, and precipitation was 1.44 in. May 2 was rainy and heavily overcast, clearing about 4 p.m. with gusty winds. The weather bureau recorded an average wind of 8 m.p.h. from the NNW, temperature 1° F. below normal, precipitation, .08 in. The precipitation followed by a sudden shift to strong northwesterly winds and the drop in temperature are characteristic *cold front* phenomena.

On May 2, during 9 hours in the field, I saw 98 species, 18 of which are considered here as true transients. The latter were: Eastern Kingbird (*Tyrannus tyrannus*), 25; Olive-backed Thrush (*Hylocichla ustulata*), 7; Gray-cheeked Thrush (*H. minima*), 3; Veery (*H. fuscescens*), 2; Black and White Warbler (*Mniotilta varia*), 3; Golden-winged Warbler (*Vermivora chrysoptera*), 1; Black-throated Green Warbler (*Dendroica virens*), 3; Cerulean Warbler (*D. cerulea*), 1; Blackburnian Warbler (*D. fusca*), 1; Chestnut-sided Warbler (*D. pensylvanica*), 1; Bay-breasted Warbler (*D. castanea*), 3; Black-polled Warbler (*D. striata*), 16; Ovenbird (*Seiurus aurocapillus*), 2; Louisiana Water-thrush (*S. motacilla*), 1; American Redstart (*Setophaga ruticilla*), 2; Bobolink (*Dolichonyx oryzivorus*), 240; Scarlet Tanager (*Piranga olivacea*), 6; and Rose-breasted Grosbeak (*Pheucticus ludovicianus*), 1.

Other migrants observed the same day included the Common Loon (*Gavia immer*), Black-crowned Night Heron (*Nycticorax nycticorax*), three species of ducks, Osprey (*Pandion haliaetus*), Barn Swallow (*Hirundo rustica*), three species of transient wrens, and large flocks of many resident species, including Blue Grosbeak (*Guiraca caerulea*), 22. Since these species are resident part of the year at Birmingham, they cannot be considered as true transients for the purpose of this paper although many individuals may be.

Adverse Wind.—The northerly winds, or *adverse winds,* which follow a cold front usually last two or three days and the weather is clear and cool. This weather is characteristic of the eastern side of a high (see Fig. 2). Birds are generally grounded by strong head winds, but when the winds lessen they

probably move on. Lowery (1945:97–98) and Weston (1947:152) say that migrants usually leave the Gulf coast the day after passage of a cold front. Possibly many true transients seen at Birmingham during periods of adverse winds were grounded in Gulf coast areas by a cold front.

On May 10, 1947, I observed a concentration of true transients held up by unfavorable winds, typical of 11 such instances noted. On May 9, the wind had averaged NE, 12.5 m.p.h., temperature was 9° F. below normal. Ten Bobolinks were the only true transients seen. On May 10, the wind was still NE but with negligible velocity and the temperature was 10° F. below normal. However, 11 species of true transients were seen, as follows: Black and White Warbler, 3; Tennessee Warbler (*Vermivora peregrina*), 4; Magnolia Warbler (*Dendroica magnolia*), 2; Black-throated Green Warbler, 1; Chestnut-sided Warbler, 4; Bay-breasted Warbler, 8; Black-poll Warbler, 4; Ovenbird, 4; American Redstart, 3; Bobolink, 14; and Scarlet Tanager, 3.

South Wind.—While northerly winds prevail, there is a gradual shift from NW to NE or NNE under the influence of a high pressure cell moving eastward. When this cell—at the station or north of it—passes east of the observer, the wind shifts from NE to SE or SSE. This is the *south wind* typical of the western side of a high (see Fig. 3). In spring, noticeable warm fronts are seldom recorded at Birmingham because the cold, dry air masses are greatly modified by the proximity of the Gulf of Mexico.

True transients are observed at Birmingham on the day of a wind shift to southerly as described above. This is the resumption of migration which Bagg *et al.* (1950:13) say occurs when a region becomes part of the warm sector of a low pressure area or the western side of a high. During the balance of the period of southerly winds, the arrival of most of the local summer residents is recorded and daytime migrants such as hawks and swallows are observed. Although few true transients are seen by day on the ground (see *clear, warm*), observations of birds passing before the moon show that heavy migration is taking place.

Of 16 such days in four years with a shift to *south wind*, April 19, 1947, is typical. On the two preceding days, winds were northerly and the average temperatures 10° F. and 8° F. below normal, respectively. On April 19, the wind shifted to south, the temperature was normal and there was no precipitation. The following true transients were seen: Olive-backed Thrush, 2; Black and White Warbler, 1; Worm-eating Warbler (*Helmitheros vermivorus*), 1; Golden-winged Warbler, 2; Cerulean Warbler, 10; Blackburnian Warbler, 2; Ovenbird, 1; and American Redstart, 2.

Rain Alone.—Frequently, true transients were seen during rain not associated with the passage of a cold front or other adverse weather. Apparently

the *rain alone* was sufficient to ground these birds. Typical of 17 such observations was that of April 21, 1949.

On April 20, the wind was ESE, 9 m.p.h., and, although April 20 was the second day of southerly winds, the temperature was 7° F. below normal. On April 21, the wind was still ESE and averaging 12 m.p.h., the temperature was 3° F. below normal, and .2 inches of rain fell. I saw the following true transients during this rain: Worm-eating Warbler, 2; Cape May Warbler (*Dendroica tigrina*), 1 (unusual this far west but the wind had been easterly for three days); Black-poll Warbler, 16; Ovenbird, 1; and Scarlet Tanager, 8.

Clear, Warm.—This is the most favorable weather for spring migration, with moderate tail winds (southerly), good visibility, and generally good flying conditions. Usually, *clear, warm* weather occurs in April the day after a high passes to the east. Examples are April 23, 1947 (Veery, 1; Eastern Kingbird, 4); April 7, 1948 (Black and White Warbler, 4); and April 26, 1949 (Scarlet Tanager, 1). Early in spring, however, rainy weather preceding the next cold front usually arrives the day after a southerly wind resumes.

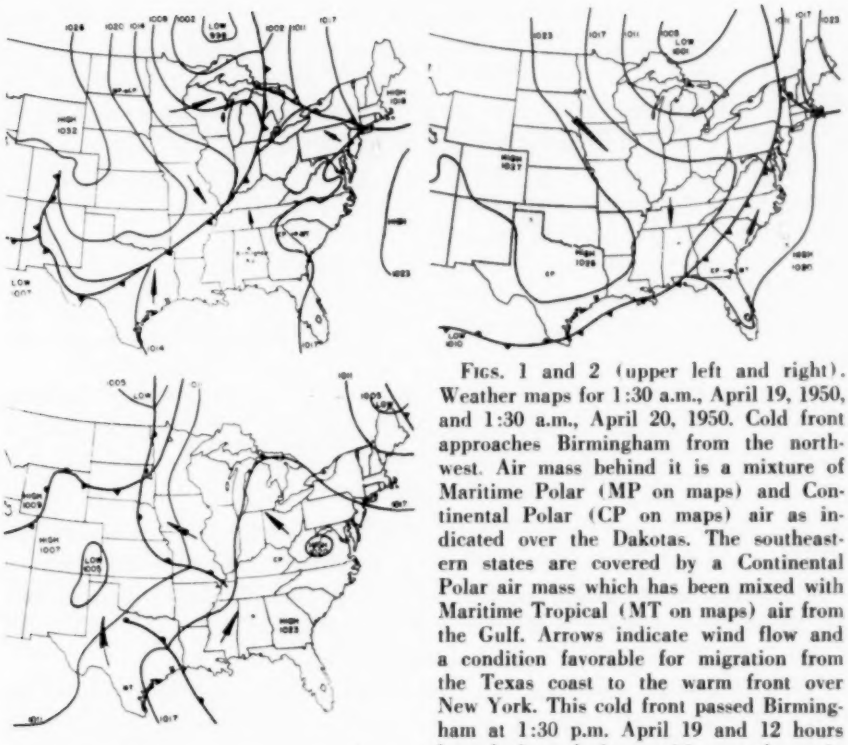
In May, this *clear, warm* weather usually persists a week or longer. Records of true transients are: May 16, 1947, the 6th day of a 10-day period of southerly winds, Blackburnian Warbler, 1; May 10, 1950, the 9th day of a similar 13-day period, Chestnut-sided Warbler, 1.

A Typical Weather Cycle

In order to show more fully the relationships of these weather components to migration, a complete weather cycle, from April 16 to 22, 1950 is analyzed below. (Figs. 1, 2, and 3 are weather maps for parts of this cycle.) During the 372 days of the study in four years, 65 such cycles were recorded.

On April 16, 1950, Birmingham experienced its fifth straight day of *cold, clear* weather after passage of a cold front on April 11, with the cold air coming from the eastern side of a high pressure area in mid-continent. Late on April 17 this high passed to the east of Birmingham, the wind veered to S, the temperature was only 2° F. below normal, and .03 in. of rain fell.

On the 18th, 74 species of birds were observed in 5.5 hours spent almost entirely in woodland and around a small lake. The wind was SSE, temperature normal, and .68 in. of rain fell. One Parula Warbler (*Parula americana*) and one Ovenbird were the only true transients seen. Also seen were five species of ducks (including 163 Lesser Scaup, *Aythya affinis*), Osprey, Sora (*Porzana carolina*), Wilson's Snipe (*Capella gallinago*), Spotted Sandpiper (*Actitis macularia*), Solitary Sandpiper (*Tringa solitaria*), Winter Wren (*Troglodytes troglodytes*), Long-billed Marsh Wren (*Telmatodytes palustris*), and Blue-headed Vireo (*Vireo solitarius*). As usual, a good portion of the migrants seen are species that winter locally or on the Gulf Coast, and rarely breed in Alabama.



FIGS. 1 and 2 (upper left and right). Weather maps for 1:30 a.m., April 19, 1950, and 1:30 a.m., April 20, 1950. Cold front approaches Birmingham from the northwest. Air mass behind it is a mixture of Maritime Polar (MP on maps) and Continental Polar (CP on maps) air as indicated over the Dakotas. The southeastern states are covered by a Continental Polar air mass which has been mixed with Maritime Tropical (MT on maps) air from the Gulf. Arrows indicate wind flow and a condition favorable for migration from the Texas coast to the warm front over New York. This cold front passed Birmingham at 1:30 p.m. April 19 and 12 hours later had reached a position as shown in Fig. 2, bringing unfavorable conditions for migration to all the eastern states except a narrow strip along the Atlantic coast. See text for details of weather and birds observed at Birmingham on April 18 and 19.

FIG. 3 (lower left). Weather map for 1:30 a.m., April 22, 1950. Conditions favorable for resumption of migration. The high centered over Wyoming on April 19 (see Fig. 1), while moving south to Texas, has poured cold air into the southeastern states and blocked spring migration with its northerly winds. At 1:30 p.m. on April 21 this high was over Alabama and Fig. 3 shows it in Georgia. Now east of Birmingham, its clockwise rotation brings southerly winds on its western side and migration is resumed there. Both warm fronts (over Texas and Missouri) are disintegrating as is also the Minnesota cold front with hollow 'teeth.' See text for weather details and birds observed at Birmingham on April 22.

Another *cold front* arrived on the 19th; the temperature was 2° F. above normal but went to 9° F. below normal the next day and the wind veered to NW after a trace of rain. In 2¾ hours afield on the 19th, I saw seven species of true transients: Philadelphia Vireo (*Vireo philadelphicus*), Black and White Warbler, 3; Worm-eating Warbler, 3; Tennessee Warbler, 1; Cerulean Warbler, 6; and Ovenbird, 5. Other migrants included in a total of 66 species observed were uncommon winter residents: Palm Warbler (*Dendroica palm-*

TABLE 3

RELATIVE INFLUENCE OF WEATHER FACTORS ON MIGRANTS IN SPRING AT BIRMINGHAM, ALABAMA*

Column number	1	2	3	4	5	6	7
Weather factors	*No. of Occurrences*	*No. of days afield during phenomena*	*No. of days on which migrants were seen*	*% of days afield (Column 2)*	*No. of migrants seen*	*% of all migrants seen*	*Migrants per day (Column 5/ Column 3)*
Cold Front	48	25	16	64.0	417	46.2	26.2
Adverse Wind	67	26	11	42.3	148	16.5	13.5
South Wind	47	22	16	72.7	165	18.3	10.3
Rain Alone (not on frontal days)	72	25	17	68.0	161	17.8	9.5
Clear Warm	43	10	5	50.0	12	1.2	2.4
Total	277	108	65	60.0	903	100.0	(mean) 14.0

* The first migrants for the year were seen in 1947 on Mar. 29; 1948, Mar. 30; 1949, Mar. 19; and 1950, Mar. 28. Above figures are from those early dates until June 1. Peaks of migration for true transients; 1947, Apr. 14–May 10; 1948, Apr. 25–May 14; 1949, Apr. 11–May 12; 1950, Apr. 8–May 1.

arum), House Wren (*Troglodytes aëdon*), Pine Siskin (*Spinus pinus*), and White-crowned Sparrow (*Zonotrichia leucophrys*); early-arriving summer residents: Yellow-breasted Chat (*Icteria virens*), Blue Grosbeak, Indigo Bunting (*Passerina cyanea*), and Dickcissel (*Spiza americana*); and one transient: Upland Sandpiper (*Bartramia longicauda*).

April 20 and 21 were days of *adverse winds*; the *south wind* resumed on April 22 with a shift from NE to SW, a trace of rain, and a sharp rise in temperature. On the 22nd I saw four species of true transients: Golden-winged Warbler, 1; Parula Warbler, 1; Cerulean Warbler, 5; and Ovenbird, 3. Migrant Chuck-will's-widows (*Caprimulgus carolinensis*) and Blue-headed Vireos were also seen.

DISCUSSION AND CONCLUSIONS

Correlation of Migration with Weather.—Almost half the individuals (46.2%) of all true transients were recorded on days when the wind shifted to strong northwesterly, that is, days when a *cold front* grounded migrating birds. An average of 26.2 (individual) true transients were seen on each such day afield (12 per hour). The effect of other weather factors is as shown in Table 3, column 7. Although I spent only 10 of 108 *clear, warm* days afield and saw only 1.2 per cent of all true transient individuals in such weather, the average of 2.4 birds per trip in *clear, warm* weather as compared to 14 true transient individuals per trip for all types of weather seems significant.

Urgency of Spring Migration.—In spring, apparently, the individual migrating bird takes advantage of favorable weather to advance as far as possible. Frequently, especially after a period of strong southerly winds,

some birds, notably warblers, are found far north of their usual range. For instance, in the New York City region up to 1941 there were 42 spring records for the Prothonotary Warbler (*Protonotaria citrea*) and 15 spring records for the Yellow-throated Warbler (*Dendroica dominica*) (Cruickshank, 1942:372, 394). Neither of these birds normally breeds at New York. In late March, 1950, no less than 14 Hooded Warblers (*Wilsonia citrina*) reached Wisconsin, Illinois, Ohio, and Ontario during a period of strong southerly winds (Robbins, 1950:232). In a similar period in April, 1947, the Blue-gray Gnatcatcher (*Polioptila caerulea*), White-eyed Vireo (*Vireo griseus*), Worm-eating Warbler, Hooded Warbler, Summer Tanager (*Piranga rubra*), and Harris's Sparrow (*Zonotrichia querula*) reached Toronto, Ontario (Gunn and Crocker, 1951:142). In my study, also, migrants seemed to move northward whenever weather permitted.

Migration by Day.—Urgency of migration is such that on occasion some true transients migrate by day. Lowery (1945:95) and Williams (1945:108) state that the arrival of a cold front in daylight will precipitate these migrants. A typical example at Birmingham is that of April 25, 1947. At 1 p.m. the wind was SW, the temperature 78° F., and rain was commencing. At 2 p.m. it was 79° F., and at 3 p.m. with a wind shift to NW, the temperature had dropped to 65° F. At 4 p.m. the rain stopped and the weather began to clear. At 4:30 p.m. I saw the following on a wet field: Little Blue Heron (*Florida caerulea*), 2; Solitary Sandpiper, 2; Lesser Yellow-legs (*Totanus flavipes*), 1; and Bobolink, 1.

Winter Range.—During the four-year study, I recorded 28 species of true transients. Some records of all but the Black-billed Cuckoo (*Coccyzus erythropthalmus*), Least Flycatcher (*Empidonax minimus*), and Blue-winged Warbler (*Vermivora pinus*) are mentioned above. Of these 28 species, 9 winter in South America, 5 in South and Central America (American Redstart also in the West Indies), and 14 in Central America and the West Indies (3 of the last, the Black and White Warbler, Parula Warbler and Ovenbird, also winter in southern United States, especially in Florida). Of the individuals recorded, 61% winter in South America, and 23.9% in Central America and the West Indies. However, by number of records there were 37% of South American-wintering species, and 44.5% of those that winter in Central America and the West Indies. In short, I saw more South American-wintering individuals, but saw Central American and West Indian winterers more frequently. The difference, percentage-wise as in Table 4, indicates a relatively even mixture of the two categories.

Equality of Adverse Weather Types.—The distribution of records of true transients observed during the various types of adverse weather is remarkably uniform. Of the 28 species, 26 were seen immediately after *cold fronts*,

TABLE 4

FREQUENCY OF SPRING MIGRANTS AT BIRMINGHAM, ALABAMA, IN RELATION TO THEIR ORIGINS AND DESTINATIONS*

Origin	Destination						Totals by origin			
	North of Alabama			Alabama						
	Records	Individuals	Percent	Records	Individuals	Percent	Records	Percent	Individuals	Percent
S. America (9 species, of 28)	51	435	79.0	33	116	21.0	84	37.0	551	61.0
Cent. Amer., W. Indies, southern U. S. (14 species, of 28)	28	65	30.0	73	151	70.0	101	44.5	216	23.9
S. Amer., Cent. Amer., W. Indies, southern U. S. (5 species, of 28)	21	56	41.2	21	80	58.8	42	18.5	136	15.1
Totals (by destination)	100	556		127	347		227	100.0	903	100.0

* Long range migrants, wintering in South America and breeding north of Alabama, comprise 48.2% (435/903) of all true transients seen. Short range migrants, wintering in Central America, West Indies, and southern U. S. and breeding—at least in part—in Alabama, comprise 16.7% (151/903). Medium range migrants comprise the remaining 35.1%.

21 during periods of *adverse winds*, 24 immediately after resumption of *south winds*, 21 on days of *rain alone* (that is, rain not associated with frontal wind shifts), and only 6 in (favorable) *clear, warm* weather (shown in detail in Tables 1 and 2).

Flyways.—The coastal hiatus is described by Williams (1950b:176–179) as a triangle with a base along the Gulf Coast from about Houston to about Tallahassee, and the apex near where Alabama, Mississippi, and Tennessee meet. Of 227 records of true transients (one record being one day's observation of a species), 133 (58.6%) are of species using both the Mississippi and Atlantic Flyways; 67 (29.5%) are Atlantic Flyway birds, and only 27 (11.9%) are Mississippi Flyway users. These data (shown by species in Tables 1 and 2) suggest that Birmingham lies near the apex of this triangle and closer to its eastern (Atlantic Flyway) side. This agrees with Williams' map (1950b:178) except that perhaps the eastern leg should be at least 50 miles further east.

SUMMARY

A study was made for 1947–1950 at Birmingham, Alabama of 227 spring records of 28 species of land birds that winter south of the Rio Grande and breed east of the Mississippi River. Daily weather at Birmingham was labelled *cold front, adverse* (north) *wind, south wind, rain alone,* and *clear,*

warm, and the numbers and kinds of transient birds recorded on each day afield were tabulated and studied. These true transients (*i.e.*, night migrating land birds wintering south of the Rio Grande and breeding east of the Mississippi, but not locally) were found in all types of weather but especially after a *cold front* (46.2%) and seldom in *clear, warm* weather (1.2%).

Most of the individuals seen (58.6%) were of species that use both the Atlantic and Mississippi Flyways. Birds that winter in Central America and the West Indies were seen more often (44.5% of the records), but South American winterers were more numerous (61.0% of the individuals).

Birmingham probably lies within the triangular hiatus of Williams (1950b: 178) on the eastern side near the apex.

Literature Cited

Bagg, A. M., W. W. H. Gunn, D. S. Miller, J. T. Nichols, Winnifred Smith, and F. P. Wolfarth

1950 Barometric pressure-patterns and spring bird migration. *Wilson Bull.*, 62:5–19.

Burleigh, T. D.

1944 The bird life of the gulf coast region of Mississippi. *La. State Univ. Mus. Zool. Occ. Papers*, 20:329–490.

Cruickshank, A. D.

1942 Birds around New York City. *Amer. Mus. Nat. Hist., Handbook Series*, 13:1–489.

Gunn, W. W. H., and A. M. Crocker

1951 Analysis of unusual bird migration in North America during the storm of April 4–7, 1947. *Auk*, 68:139–163.

Lowery, G. H., Jr.

1945 Trans-Gulf spring migration of birds and the coastal hiatus. *Wilson Bull.*, 57: 92–121.

1946 Evidence of trans-Gulf migration. *Auk*, 63:175–211.

Peterson, R. T.

1947 A field guide to the birds. Rev. Ed. (Houghton Mifflin & Co., Boston).

Robbins, C. S.

1950 A summary of the spring migration. *Aud. Field Notes*, 4:231–233.

U. S. Department of Agriculture, Yearbook

1941 Climate and man. *House Document*, 27:1–1248.

U. S. Department of Commerce, Weather Bureau

1947–1950 Monthly climatological summary and station meteorological summary for Birmingham, Ala. Weather Records Processing Center, Chattanooga, Tennessee.

Weston, F. M.

1947 Spring migration, Pensacola (Florida) region. *Aud. Field Notes*, 1:152–153.

Williams, G. G.

1945 Do birds cross the Gulf of Mexico in spring? *Auk*, 62:98–111.

1950a Weather and spring migration. *Auk*, 67:52–65.

1950b The nature and causes of the 'Coastal Hiatus.' *Wilson Bull.*, 62:175–182.

307 38th Street, Fairfield, Alabama, April 16, 1952

GENERAL NOTES

Fresh-water mollusks fed to young Tree Swallows.—While studying nesting Tree Swallows (*Iridoprocne bicolor*) at the University of Michigan Biological Station in the summer of 1952, I found evidence that the adult birds were feeding their young on fresh-water snails and clams.

A number of snail shells and one clam shell were found among the fecal sacs which accumulated in the nests during the last few days before the young left the nest. Each snail shell showed signs of chemical action on the surface and was filled almost to the tip of the spire with fecal matter.

To test the assumption that snail shells would be recovered in this form after passing through the digestive tract of a swallow, a young Purple Martin (*Progne subis*)—the only species then available—was fed eight snail shells of the size of those found in the Tree Swallow nests. Within 16 hours four of these snails had passed through the digestive tract of the Purple Martin to be deposited separately from the fecal sacs. They were nearly identical in appearance to the shells found in the Tree Swallow nests.

Seven of the 26 Tree Swallow nests studied at the Station contained these shell remains. The shells were identified by Dr. Frank E. Eggleton, of the University of Michigan, as *Physa sayi*, *P. gyrina*, *Helisoma antrosa percarinatum*, and *Sphaerium* sp. These species were all abundant within a half mile of the nesting boxes, inhabiting shallow water areas and occasionally emerging on the vegetation or wet sandy beaches. The swallows may have picked up the mollusks from the beach, from vegetation, or from the surface of quiet water.

Dr. A. L. Nelson, Director of the Patuxent Research Refuge at Laurel, Maryland, has kindly notified me that there are a few unpublished records of unidentified mollusks eaten by several species of swallows.—MARY-ELIZABETH WHELAN, *University of Michigan Biological Station and Muskegon (Michigan) Public Schools, September 30, 1952.*

Identification of songbird nests by reclaimed eggshell fragments.—During the course of a study started in October, 1952, aimed at an evaluation of use of habitat improvement plantings by wildlife, songbird nests were collected and brought into the laboratory for identification. Here they were keyed with the aid of Richard Headstrom's recent guide (1949. "Birds' Nests. A Field Guide." Ives Washburn, Inc., New York). Many of the nests were from previous season's nesting attempts. Measurements and positive identification were hampered by damage in collecting and from the middens of white-footed mice (*Peromyscus leucopus*). It was, therefore, necessary to find bits of eggshells, either to confirm identification made from the key or, in some instances, to determine which of two or three species with similar nests had built the one in question.

The bottom parts or often the entire nest were put into a 6 inch diameter battery jar (2 gallon capacity) half full of water. The water and nest material were thoroughly mixed for approximately 30 seconds with a small electric mixer. As soon as the contents settled, the floating debris was skimmed off and the muddy water carefully poured away. Repeated washing and decanting floated away all objects of lesser density than the eggshells which were then easily reclaimed from the bottom of the jar. Almost all pieces of shell found were large enough to show any speckled pattern present and shell colors were easily distinguished without magnification.—JOSEPH C. RIEFFENBERGER, *Forestry Section, Illinois Natural History Survey, February 5, 1953.*

Barrow's Golden-eye using Crow nests in British Columbia.— There appears to be no mention in the literature of Barrow's Golden-eye (*Bucephala islandica*) nesting in old Crow (*Corvus brachyrhynchos*) nests. This note records two such nests. Munro (1939. *Trans. Royal Can. Inst.*, 22 (Pt. 2):259–327) recorded six nests of Barrow's Golden-eye found in British Columbia, five of them in holes in trees and one in a marmot burrow. He also noted nests found on the ground in other parts of the world, but did not mention utilization of stick nests.

During the summer of 1948, I was employed by the University of British Columbia and the British Columbia Game Commission to participate in a waterfowl population survey on Anahim Lake, B. C., and vicinity (Lat. 52° 30′ N., Long. 125° 20′ W.), an area about 90 miles from salt water at Bella Coola, but in the dry lee of the Coast Mountains.

On June 6, with J. S. Tener, I was working on Abuntlet Lake, the first lake downstream from Anahim Lake on the Dean River. There were two small islands in this shallow lake, each less than 200 feet long and about 50 feet wide. One was low and covered with dense alder and willow growth while the other rose higher from the water, was forested with trembling aspen and Engelmann spruce, and fringed with alder and willow at its shores. Both islands had a dense understory of an unidentified *Ribes*.

The waterfowl nests located on these islands were: seven Mallard (*Anas platyrhynchos*), three Barrow's Golden-eye, one Pintail (*Anas acuta*), and one Canada Goose (*Branta canadensis*). One occupied Crow nest was found. Two of the three Golden-eye nests were in old Crow nests and the third was in a hole twelve feet up in a large aspen stub. Of the two in Crow nests, one was fifteen feet above the water in a willow (*Salix* sp.), the other seven feet over the water in an alder (*Alnus sinuata*). They contained six and eight eggs respectively. The photograph is of the former nest. Both clutches were unchanged on June 24, and both had fully hatched by June 28.

Such nesting sites may be commonly used in western British Columbia, for C. F. McLeod, in 1950, noted that similar nesting sites were used near Stum Lake (Lat. 52° 20′ N., Long. 123° 00′ W.).

It should be noted that if nesting sites limited the size of golden-eye populations about these lakes, then the Crow could have augmented waterfowl production through providing suitable sites. This is an interesting possibility for a species popularly regarded as detrimental to breeding populations of waterfowl.—R. Y. Edwards, *British Columbia Forest Service, Victoria, B. C., September 2, 1952.*

Warblers, hummingbird, and sapsucker feeding on sap of yellow birch.—From September 3 to 6, 1952, I observed a Ruby-throated Hummingbird (*Archilochus colubris*), two Black-throated Blue Warblers (*Dendroica caerulescens*), a Cape May Warbler (*Dendroica tigrina*), and Yellow-bellied Sapsuckers (*Sphyrapicus varius*) as they came to feed on the sap of a yellow birch (*Betula lenta*) in Tamworth, New Hampshire. The tree had been drilled by sapsuckers in previous years and was partly dead. The Cape May Warbler was first noticed on September 4, when it clung to the bark and dipped its bill repeatedly in holes which a hummingbird had been visiting. Soon after, a male Black-throated Blue Warbler lit in the same place. It fed for 30 seconds, rested a bit on a twig, then fed for another 30 seconds before flying away. Both species of warbler fed in much the same fashion and seemingly were afraid of wasps which came to the feeding area in small numbers. The Cape May Warbler paid 5 visits in 75 minutes. On September 6, it was observed again feeding off and on for 6 minutes at the sapsucker holes. Black-throated Blue Warblers visited the tree eight times during periods of observation; two of the visits were by females. The longest single period at the tree for the sapsucker was 35 minutes and for the hummingbird, 15 minutes. It would seem unlikely that these visitors were after insects as a continuous supply would have been required and I saw none on close inspection. It also seemed improbable that the warblers were after water since there was a small brook nearby.

Observations of hummingbirds and warblers feeding at sapsucker-drilled trees have been previously recorded (Bent, A. C., *U. S. Natl. Mus. Bull.*, 174:136, 150). For these birds, the sap may serve as a substitute for nectar. This approach to nectar-feeding by warblers is of interest in view of Beecher's recent statement (1951. *Wilson Bull.*, 63:274–287) that the warblers (Parulidae) are, in fact, closely related and probably ancestral to certain honey creepers ("tribe Coerebini") which are confirmed nectar-feeders.—Lawrence Kilham, *8302 Garfield Street, Bethesda, Maryland, October 11, 1952.*

Siskin and goldfinch feeding at sapsucker tree.—On December 28, 1952, I watched a male Yellow-bellied Sapsucker (*Sphyrapicus varius*) that was visiting his borings 30 feet up in the trunk of a 50-foot sweet gum (*Liquidambar styraciflua*) growing in a swampy portion of the Ocmulgee National Monument, Macon, Georgia.

A Common Goldfinch (*Spinus tristis*) and several Pine Siskins (*Spinus pinus*) were gathering food from the dried fruit capsules hanging in the same tree. When the sapsucker left the trunk a siskin replaced him at the borings and began to pick lightly at them. Evidently the bird was taking sap because it hesitated a while between "picks"—apparently waiting for more sap to flow. The same siskin made three trips to these holes before being chased away by the returning sapsucker. Again the woodpecker left and was replaced this time by the goldfinch which behaved in a manner similar to that of the siskin.—H. Lewis Batts, Jr., *Kalamazoo College, Kalamazoo, Michigan, January 9, 1953.*

An apparently hybrid golden-eye.—An adult male golden-eye collected at Petitcodiac, New Brunswick, by H. C. White, on April 14, 1951, now specimen No. 78916 in the Royal Ontario Museum of Zoology and Palaeontology, is apparently of hybrid origin. In the following remarks characters described and compared are presented approximately in the order of their importance for specific identification of adult males of Common (*Bucephala clangula*) and Barrow's (*Bucephala islandica*) golden-eyes in full breeding plumage. The trachea of the specimen was not preserved.

Facial spot: Nearer round in shape (as in *B. clangula*) than crescentic but slightly longer dorso-ventrally.

Scapulars: Black and white feathers with bicolored tips, the black portion of the outer web, though narrow, is extended into a pointed process as in *B. islandica*. The general pattern effect of the area tends to be streaked, rather than spotted, as in *B. clangula* and the extent of the white scapular pattern is more like that form, less restricted than in *B. islandica*.

Head gloss: Major effect is peculiar, being reddish purple, unlike the bluish purple gloss of *B. islandica* and also unlike the green gloss of *B. clangula*.

Shape of bill: Dorsal view shows no pronounced taper toward the tip and thus is well within range of variation of *B. clangula*. Lateral view, not relatively as deep at base as in *B. islandica*; within range of variation of *B. clangula*. Nail rather broad at the tip and more fully and abruptly arched distally than is usual for *B. clangula*, thus tending toward *B. islandica*.

Color pattern of wing: Relative amount of black and white is intermediate between *B. clangula* and *B. islandica*. The black area involving the lesser wing coverts is more extensive than in *B. clangula* but less so than in *B. islandica*. The black basal portion of the greater coverts is largely veiled by the white middle coverts but a narrow and broken bar is exposed, though it is not nearly as broad and conspicuous as in *B. islandica*.

Flank: More heavily margined with black than in *B. clangula* but not as broadly so as in *B. islandica*.

Sides of breast, forward of folded wing: This area is essentially white as in *B. clangula* but a few feathers are black-tipped, suggesting the wholly black pattern of *B. islandica*.

Frontal bone: A small lump is tactually evident in the prepared specimen indicating a tendency toward the bulged frontals of *B. islandica*.

Nape feathers: Tend somewhat toward the elongate "mane" of *B. islandica*.

Nostrils: Nostrils nearer to *B. clangula*, not as large and wide dorso-ventrally as in *B. islandica*.

In conclusion it should be stated that all comparisons with the Common Golden-eye have been made with North American specimens, *B. c. americana*. Specimens of *B. islandica* from its eastern and western ranges have been used indiscriminately. To the best of my knowledge, the particular specimen here discussed is the first recorded case of a supposed hybrid between the Common and Barrow's Golden-eye (see Cockrum, 1952. *Wilson Bull.*, 64:140–159).—L. L. Snyder, *Royal Ontario Museum of Zoology and Palaeontology, Toronto, Ontario, October 27, 1952.*

Another American Rough-legged Hawk in Florida.—On March 25, 1950, at St. Marks National Wildlife Refuge in Wakulla County, northern Florida (on the Gulf of Mexico), we observed an American Rough-legged Hawk (*Buteo lagopus*) perched in a dead tree in a marsh. We watched the bird for about twenty minutes; it was in typical light plumage with white base of tail and black wrist patch.

The A.O.U. Check-List (1931:69) gives American Rough-legged Hawk as ranging south in winter to "southern California, southern New Mexico, Texas, Louisiana, and North Carolina." However, Sprunt (1940. *Auk*, 57:564–565) mentions a number of sight records from Florida; and there is a record from Thomasville, Georgia (about 50 miles north-northeast of St. Marks) of a Rough-legged Hawk shot in February, 1925 (Stoddard, 1928. *Auk*, 45:211).—Richard A. Herbert and Kathleen Green Skelton, *Linnaean Society of New York, November 11, 1952.*

Bird notes from the Grand Prairie of Arkansas.—Since the publication of Baerg's "Birds of Arkansas" (1951. *Univ. of Arkansas, Agric. Exp. Sta. Bull.* 258, Revised), we have had opportunity to clarify the status of a number of species about which little was known in east-central Arkansas, and to add a few species to the State list. From a considerable mass of observations the following have been selected.

These records are entirely from Arkansas, Lonoke, and Prairie counties, the section of Arkansas commonly known as "the Grand Prairie," and from the lowlands of the Arkansas and White Rivers and the Bayou Meto, which adjoin Arkansas County on three sides. Observations by the senior author have been nearly daily since May, 1950, while those of the junior author have been intermittent but total almost 24 months since the spring of 1948. Several short notes on specific subjects have already been published. Where specimens were taken these have been sent to the U. S. National Museum.

Colymbus grisegena. Holboell's Grebe. One was seen on a flooded area near Humnoke, Lonoke County, October 21, 1951.

Podilymbus podiceps. Pied-billed Grebe. On October 12, 1952, we found a Pied-billed Grebe incubating four eggs near Lonoke. Incubation continued through October 21. The last week of October brought freezing weather and the nest was deserted.

Guara alba. White Ibis. Baerg listed one record by Van Huizen in Arkansas County, September 10, 1950. Van Huizen again saw White Ibises in 1951, and on September 15, 1952, Neff saw an immature White Ibis flying along a rice field canal 4 miles east of Stuttgart.

Dendrocygna bicolor. Fulvous Tree Duck. First recorded in Arkansas near Lonoke by Marshall, Coffey, and Block (Baerg) on September 20, 1950; a flock of eight was reported to us from the same area in September, 1952, and a male was taken there on September 17.

Ictinia misisippiensis. Mississippi Kite. Along the lower reaches of the Bayou Meto, the Arkansas River from the mouth of Bayou Meto downstream, and probably along the lower White River, this kite is a fairly common breeding bird. During May and June kites are often seen catching dragonflies just a few feet over the water in the rice fields adjoining the bottomland forests.

Since we discovered this species south of Gillett in the summer of 1950 we have seen it on numerous occasions. During the summer of 1952 fourteen pairs were under observation; most of the nests are high up in the tall bottomland cottonwoods. Earliest spring date was May 5, 1951, while the latest autumn date was at Nady, Arkansas County, September 13, 1952, recorded by Anna G. Meanley.

Buteo lineatus texanus. Texas Red-shouldered Hawk. A female taken near Hazen

on December 10, 1951, with cinnamon rufous breast, and conspicuous dark shaft lines in the breast feathers, was identified by Meanley at the U. S. National Museum as of this race, not previously reported in Arkansas.

Rallus limicola. Virginia Rail. Baerg listed only two sight records. An adult male was taken in a rice field near Hazen, Prairie County, on November 15, 1952.

Porzana carolina. Sora. This species is an abundant migrant through the eastern Arkansas rice country, especially in autumn. A dead male, frozen into the ice along a roadside ditch on February 3, 1951, proved at least occasional wintering, and three seen in a rice field on July 12, 1951, indicate possible breeding.

Coturnicops noveboracensis. Yellow Rail. The third State record is based on a bird flushed from a rice stubble field south of Stuttgart on October 9, 1952.

Gallinula chloropus. Florida Gallinule. Although this species was already known to breed in the Lonoke area, a nest with six eggs was noted on a fish farm near Lonoke on September 9, 1952 and four downy young not over one week old were seen on a neighboring farm on September 17, 1952.

Pluvialis dominica dominica. American Golden Plover. Although known as a common spring migrant through Arkansas, its occurrence as a common autumn migrant in the Grand Prairie area is apparently unrecorded. Small flocks were seen each day through November, 1951, and single birds were seen near Stuttgart as late as December 1 and 3 of that year. Specimens were collected on November 16, 1950, and November 2, 1951.

Columbigallina passerina. Ground Dove. A single bird was flushed from a farm road five miles southwest of Stuttgart on September 15, 1952, but managed to escape. This appears to be the first record for Arkansas.

Crotophaga sulcirostris. Groove-billed Ani. A new State record was established when a male was collected about seven miles southeast of Stuttgart on September 21, 1952. The bird was discovered perched in a dead tree about 20 feet high in a brushy field border. Its stomach was full of grasshoppers.

Limnothlypis swainsonii. Swainson's Warbler. We have been able to locate Arkansas records from only three localities in earlier literature. Along the lower White and Arkansas River bottomland forests adjoining Arkansas County the species is fairly abundant in May and June. Five singing males were heard in a canebrake east of Tichenor on May 9, 1951. Four singing males were heard in timbered areas near Nady during May and June, 1952. A male was collected on June 12, 1952.

Spiza americana. Dickcissel. One of the most common breeding passerines in the area, the Dickcissel is apparently unrecorded as a winter resident. During the winters of 1950–51 and 1951–52 we found single Dickcissels associating with the flocks of English Sparrows (*Passer domesticus*) about the farmyard of a majority of the farms visited. They fed with the sparrows in the barnlots, on straw stacks, and in open sheds. Dates ranged from mid-January to April.

Zonotrichia querula. Harris's Sparrow. In east-central Arkansas this species appears to be rare. C. M. Owen (now deceased) banded one at DeWitt some 18 years ago. We banded one near Stuttgart on November 27, 1950, and collected an immature male near Nady on November 3, 1952.—Brooke Meanley and Johnson A. Neff, *U. S. Fish & Wildlife Service, Stuttgart, Arkansas, and Denver, Colorado, December 8, 1952.*

Groove-billed Ani in Oklahoma.—On October 7, 1952, a Groove-billed Ani (*Crotophaga sulcirostris*) was shot by Lewis T. Pickett at Duncan Lake, about 11 miles northeast of Duncan, Stephens County, Oklahoma. On October 11, Mr. Pickett gave me the ani which, fortunately, he had not discarded. Dr. George M. Sutton, of the University of Oklahoma at Norman, made a fine study skin of the bird in spite of the fact that it was in an advanced state of deterioration. The skin is now in the University of Oklahoma museum.

The ani was a male with testes, though not large, readily perceptible even though the specimen was decomposing. Its stomach held six large grasshoppers of the genus *Melanopus* (five of one species, one of another). These were identified with the assistance of Dr. Cluff Hopla of the University of Oklahoma Department of Zoology. The bird weighed 90.6 grams. It was not emaciated but neither was it fat. The bird's plumage, on the whole, was in fine condition, but some of the larger wing and tail feathers were of a brownish cast and less glossy than the others—indication of a protracted late summer and fall molt.

The bird was sitting on a stem among the cattails surrounding the minnow ponds below Duncan Lake when Mr. Pickett first observed it. It was alone although there was a flock of Red-wings (*Agelaius phoeniceus*) in the cattails at the other end of the pond about 200 feet away.

The principal native vegetation around Duncan Lake is postoak-blackjack oak with associated mixed grasses—not particularly suggestive of the ani's native tropical and subtropical home. The summer and fall of 1952 were the driest and hottest for the lower Plains states since Weather Bureau records have been kept (1900). The unusually dry weather may have been the principal reason for the northward movement of the ani.

Mr. Raymond G. Keck, of Drummond, Garfield County, Oklahoma, wrote the Oklahoma Game and Fish Department concerning a Groove-billed Ani he saw in the trees in his yard on September 25, 26, and 27, 1952. He said the bird was tame and could be approached so closely that the grooves on the bill could be seen. He photographed the ani with his box camera. The picture, though not clear enough for reproduction here, is still good enough for positive identification of the ani.

There are several previous instances of the Groove-billed Ani occurring outside its normal range. Two instances are worthy of note here: W. S. Long (1940. *Trans. Kansas Acad. Sci.*, 43:444) mentions a specimen taken on November 1, 1904 in Lyon County, Kansas. Thomas S. Roberts (1932. "The birds of Minnesota. Vol. 1," pp. 594-595) lists a specimen taken in Goodhue County, Minnesota on October 12, 1913.

The Groove-billed Anis reported here are the first records of the species in Oklahoma.—Glenn E. Jones, *Oklahoma Game and Fish Department, Capitol Building, Oklahoma City, Oklahoma, November 24, 1952.*

Groove-billed Ani in Great Plains in 1952.—This note reports and summarizes the records of the Groove-billed Ani (*Crotophaga sulcirostris*) in Kansas and other plains states in the remarkable northward movement of this species in the autumn of 1952.

This species was first reported outside its normal range on September 21, 1952, when a male was collected seven miles southeast of Stuttgart, Arkansas (Meanley and Neff, 1953. *Wilson Bull.*, 65:201). From September 25 to 27, an ani was present at Drummond, Garfield County, Oklahoma, and a male was collected at Duncan Lake, Stephens County, Oklahoma, on October 7 (Jones, 1953. *Wilson Bull.*, 65:202). One Groove-billed Ani was seen in the vicinity of Elgin, Antelope County, Nebraska, from

late September to October 4. Unfortunately, this bird was not obtained (Baumgarten and Rapp, 1953. *Nebraska Bird Rev.*, 21:2-3).

Finally, an immature male ani was shot six and three-fourths miles northeast of Blue Rapids, Marshall County, Kansas, on October 28. The specimen was brought by Elizabeth G. McLeod to Ted Andrews, of Kansas State Teachers College at Emporia. Andrews presented the specimen to the University of Kansas, where I prepared it as a study skin. The bird weighed 67.5 grams, had some fat, and had testes approximately 3 mm. long. It was in fresh plumage with sheaths still attached to the bases of the remiges and rectrices. The ani was immature, as judged from the incompletely ossified skull.

Speculation as to the cause of this movement of at least five (and probably many more) anis from their normal range seems futile. The invasion, if it may be called that, spanned at least five weeks in time and took at least one bird 1100 miles north of the species' nearest usual haunts in southern Texas.

Groove-billed Anis were previously reported in this portion of the Great Plains only from Kansas, where a specimen was taken in Lyon County on November 1, 1904.—HARRISON B. TORDOFF, *Museum of Natural History, University of Kansas, Lawrence, March 30, 1953.*

The voice of the Grand Potoo.—The identification of birds of the night by means of their voices sounding in the darkness of virgin forests is one of the most difficult tasks of the ornithologist travelling in tropical countries. Besides the owls and the true nighthawks which lead in the nocturnal concert, there are in the New World the strange potoos (Nyctibiidae). Little has been published on their call notes. Everybody who listens for the first time to the cry of *Nyctibius griseus*, a common and widely distributed species, is in doubt whether these unusual sounds can be attributed to a bird at all. The song consists of a falling-off series of full, melodious notes that sound human. It has already been described several times (see, for instance, Sutton, 1950. *Bird-Banding*, 21:154–155) and it is generally assumed that the voices of other potoos are similar. However, this statement is misleading, at least regarding the Grand Potoo (*Nyctibius grandis*).

The voice of this species sounds like a very harsh, deep, and long *kwak* or *kaw* or *graw-ar*. The calls are uttered always separately. At pairing time the loud quacking is repeated at intervals of 10 or 20 seconds, but there is never a connection between the single notes, as in *Nyctibius griseus*. Sometimes the voice of the Grand Potoo is more like that of *Nyctibius griseus*, as many individuals of the latter species make harsh sounds, but *griseus* is always distinguishable by its uninterrupted falling-off pattern.

I find in the literature only two references which clearly deal with the voice of *Nyctibius grandis*. To Goeldi (1900. *Bol. Museu Paraense*, 3:211) the call of the Grand Potoo sounded "like the mewing of a big cat," while he reproduced the song of *Nyctibius griseus* as *pu-hu-hu*, if slowly spoken in a high voice. Haverschmidt (1948. *Auk*, 65:32) remarked that he heard strange notes of *Nyctibius grandis* sounding like *oorrroo* or *oorrr*.

It may be added that both species, when fighting, utter cries in a croaking manner different from the song described above.

These observations on the Grand Potoo were made in the state of Mato Grosso, Xingú region, Central Brazil.—HELMUT SICK, *Fundaçao Brasil Central, Avenida Nilo Peçanha 23, Rio de Janeiro, D. F., Brazil, March 12, 1953.*

Incubation and nesting behavior of the Chuck-will's-widow.— In view of the few published accounts of courtship, nesting behavior, and incubation in American goatsuckers other than the Nighthawk (*Chordeiles minor*), the following facts concerning the Chuck-will's-widow (*Caprimulgus carolinensis*) taken from the notebook of J. Southgate Y. Hoyt may be of interest. During the period from August 27, 1942, until January, 1944, while he was in the Medical Corps of the U.S. Army in Charleston, we lived in a small cottage on the edge of Summerville, South Carolina. The cottage was part of a property known as the Tea Garden, and next to our yard, between it and the azalea- and camellia-bordered walks of the Tea Garden estate proper, was an overgrown field containing a few large pines and with the ground fairly well carpeted with needles.

The Chuck-will's-widow was calling in the vicinity the week we moved in, and we heard it until September 6. The next spring we listened for its return and on March 19, 1943, we heard the first call of the Chuck-will's-widow at approximately 7:00 p.m. (E.S.T.). The bird called about ten times and was not heard calling the rest of the night.

During the next month, on warmer evenings, the bird began calling shortly after 7:00 p.m. The calling started at the same time each evening, but its duration increased from several minutes to some hours. At the time of the full moon (which was on April 20 in 1943), the bird was joined by another and they called all through the night until daybreak. As the moon began to wane, the calling seemed confined to an hour in the evening and about an hour at dawn. Occasionally a few calls were given during the night, but the activity never compared to that of the period of the full moon. By May, calling was confined to the morning and evening periods and seemed to come from the same direction every night.

At this time we began a careful checking of the position of the birds each evening, listening for any unusual calls. On May 4, we flushed one of the birds from the ground and heard another a short distance from it. On May 5, as we investigated, "we heard a bird call to the right of the path and very close to us. We waited and soon saw a bird fly from the ground to a tree. Almost at once another bird flew to the ground at the spot where the first had flown up. The first bird doubled back and joined the second on the ground. At this time we heard some fluttering and a slight vocal *chuck*ing. Soon both birds flew off and we left" (field notes). We investigated the spot but found nothing.

To the best of my recollection, we did not notice the strange clapping sound nor the increase in the speed of the calls which was noted and recorded by P. P. Kellogg in Florida and published on the record of "Florida Bird Songs" (Cornell University Press), nor does Southgate's notebook mention any such sound.

On the evening of May 6: "Returning to this same area, we approached the spot carefully and flushed the bird from the ground. Going to the exact spot, we found one egg on the pine needles. The egg was typical in color and seemed large for a bird of this size." Checking the spot again on the 7th, we found that another egg had been added during the previous 24 hours.

During the next two weeks, we checked the bird cautiously, and Southgate noted that: "Always when I approach her during the day, she seems to be sleeping and is not hard to approach." On May 23: "I returned to the nesting site and found that all was well and the bird sitting tight on the eggs, not flushing till I was within a few feet of her. I set up the blind some ten feet away and got in, only to find that she

was very timid at the sight of it. I cut some bushes and placed them over and in front of the blind and returned to my post inside. This time she returned very quickly, approaching the eggs from the back. She flew to a spot some four feet from the eggs and sat there motionless with her eyes shut for about five minutes. Then she slowly waddled onto the eggs with an awkward shuffle and, spreading her breast feathers, she gave a slight hitch that raised her body over them. She then tucked the eggs well under her with her bill and finally settled down with ease and closed her eyes again. During this performance, I was taking motion pictures of her and she seemed not to mind the click of the camera." When she left the nest, she gave two small leaps on the ground, then jumped into the air and flew to a nearby limb, uttering a slight chuckle.

On May 26, Arthur A. Allen of Cornell University arrived for a short visit with us, and "we immediately investigated the nest. One egg had hatched and the young was squatting by the other egg. This makes an incubation period of 20 days for this bird." The second egg hatched on the 27th, which seemed to prove that incubation started with the laying of the first egg.

On the 28th, we found both young under a bush about ten feet from the nest site. Quoting again from the notebook: "They jump with both feet, and look like little toads or frogs, jumping on the pine-needle floor of the woods." On the 30th, we located them about 25 feet from the nest. "The parent was brooding them, and flushed when we approached very close."

The final note is on June 17, a few days after we returned from a furlough: "Several birds were flying around our yard this evening and giving the *chucking* note as they passed near us. On the fence not far from the house we could hear some strange hissing and chucking noises that sounded very much like young birds calling for food. The singing of the birds has been very much less than in the past and has been heard only in early evening and early morning."

The birds were heard calling off and on throughout the summer until September 13, when we presumed they left the area.—Sally F. Hoyt (Mrs. Southgate Y. Hoyt), *"Aviana," Etna, New York, March 5, 1953.*

Red Phalarope in Utah.—In September 1951, botulism workers at Bear River Refuge picked up a partially-paralyzed Red Phalarope (*Phalaropus fulicarius*). This appears to be the second record of the occurrence of the species in Utah, the first having been reported by C. Lynn Hayward (1937. *Wilson Bull.*, 49:304) from southern Utah.

An interesting feature of the paralysis exhibited by this individual was that the skeletal musculature of the neck remained largely unaffected. The bird's muscles of locomotion were so weakened that it could neither stand nor move its wings, but when stimulated it carried out the characteristic side-to-side "pecking" movements associated with phalaropes. The sickened bird was hospitalized, but it failed to respond and soon died.

Dr. John W. Aldrich has had a skin prepared from the badly battered remains, and (personal communication) confirms the identification. The skin is now deposited in the Fish and Wildlife Service collection in the U. S. National Museum.

The assistance of Dr. Clarence Cottam in supplying information on the previous occurrence is gratefully acknowledged.—George W. Sciple, *U. S. Fish and Wildlife Service, Wildlife Research Laboratory, Denver, Colorado, March 13, 1952.*

Further evidence of the homing ability of the Cowbird.—Several reports have been published describing homing ability in the Cowbird (*Molothrus ater*). These reports are reviewed, and added to, by Harold B. Wood (1952. *Wilson Bull.*, 64:46).

At my station in Addison Township, Oakland County, Michigan, I banded a female Cowbird (No. 49–140409) on May 4, 1951. This bird returned on April 10, 1952, and subsequently repeated on April 12, 15, and 22. On April 22 I put her in a small canary cage, placed it on the floor of my car, and took her to a point 15 miles *south* of the station and released her at about 4 p.m. On April 28 she re-entered the same trap (a government sparrow trap). I then took her, in the same container, 22 miles *south* of the station on a different road and released her at 3 p.m. On April 29 she re-entered the same trap between 9:00 and 10:30 a.m., thus completing the 22-mile flight in from 18 to 19½ hours.

I then intended to transport the bird to a point north of the station but did not because the fore part of the bird's head was scalped at some time during the last flight. I released her at the station and she did not again enter a trap during the 1952 season.

I had presumed that the bird would not live long with what appeared to be such a serious injury. I was, therefore, considerably surprised on April 18, 1953, to find her in a Glenhaven drop-door trap situated on a steep bank near a creek. There were soft small feathers covering the fore part of her head, but across the rear of the occiput there was a ⅛-inch scar upon which no feathers grew. The nape feathers being normal, the bird had a peculiar flat-headed appearance which made it possible for me to recognize her in the field.

I held her over-night and on April 19 took her, in the cage previously mentioned, to a point 5 miles *east* of the station to the border of a small lake. The weather was stormy, snow squalls alternating with clear weather. I released her at the edge of the lake, facing east. Just at that time it began to snow again. The bird rose somewhat higher than the trees bordering the lake, seemed to hover in almost one spot, flew a short distance to the north, then to the south, then to the west (away from the lake) and into a tree. I did not see her again that day. On April 23 she returned to a sparrow trap in a field about 60 rods from the house. If she flew directly from the place where she was liberated, this was the first trap she would have come to. She was then taken in the same cage, this time completely covered with a white cotton cloth, to a point 17 miles *north* of the station. She was held over-night and photographed. At 7:45 a.m., April 24, she was released facing south. She exhibited no special behavior but flew directly to a tree. My traps were closed April 24 until late in the evening. At 9 a.m., April 25, she was in a drop-door pedestal trap at the edge of a marsh. I released her there.

On April 29 she entered a sparrow trap. Again in a covered cage, she was taken 21 miles *west* of the station and released at 5:30 p.m. She exhibited no special behavior, but flew into the nearest tree. At 9 a.m., April 30, she was back in a drop-door trap in a field 500 feet from my house. I released her there. When I had completed my work and returned to the house at 10:30 a.m. she was in a pedestal trap near the house and was released there. On May 1, 3, 15, 23, and 28 and on June 1 and 4, she repeated in various traps. Several times I saw her on perches and flying about over approximately 10 acres; the last such observation was on June 18. She made 13 entries into four types of traps in 1953. On the occasions in 1952 and 1953 when she was taken 15 and 5 miles away, she returned during the sixth and fourth days

respectively. On the flights of 22, 17, and 21 miles, she returned on the first day after release. Concerning homing experiments with wild birds, Donald R. Griffin (1953. *American Scientist*, 41 (2):218) says, "While the percentage of returns falls off with distance, the speed of those birds which do get back tends to rise or at least to remain fairly constant."—Mrs. Alice D. Miller, *1150 Brewer Road, Leonard, Michigan, August 16, 1953.*

Screech Owl observed bathing.—On November 16, 1952, at about 7:15 p.m., E.S.T., my wife and I were driving along an avenue which borders a small park in Ann Arbor, Michigan, when we saw a gray Screech Owl (*Otus asio*) standing in a puddle of water. We stopped the car within a short distance and backed up until the scene was once more fully illuminated by the car lights.

The puddle of water in which the owl was standing was 1 to 2 inches deep and approximately 2 feet in diameter. The owl appeared to be quite unafraid of the lights and of the noise of the running motor. While we watched, from a distance of 12 to 15 feet, the owl bathed in the puddle, much in the manner of a passerine bird, pushing its head and breast into the water, beating its wings, and then shaking the water from its feathers. We watched for perhaps a minute. It was not until I got out of the car and approached to within 4 or 5 feet that the owl flew away. The car lights were still on and the motor was running.

Reexamination of the site the following morning showed the puddle to have been formed in the depression at the junction of a garage driveway and the street. Both driveway and street were paved. For sometime prior to November 16 the weather had been extremely dry, so that the water in which the owl was bathing was of artificial origin, possibly from a hose.—Walter R. Crowe, *Institute for Fisheries Research, Ann Arbor, Michigan, January 9, 1953.*

Ivory Gulls in western Lake Ontario.—On January 4, 1953, two Ivory Gulls (*Pagophila eburnea*) were observed at Hamilton, on Lake Ontario, Canada, by the writer in company with David Powell and Leslie Gray. The birds, which were seen under good conditions and studied at some length, apparently were immatures, being sparingly flecked with dusky brown at the tips of the primaries and at the bend of the wing. Size appeared similar to that of Bonaparte's Gull (*Larus philadelphia*), and the birds had a small-headed, pigeon-like profile that appeared quite distinctive. The dark eyes, black legs, and dusky bill with yellowish tip were seen clearly.

When first seen the Ivory Gulls were at the edge of the ice sheet with Ring-billed and Herring gulls (*Larus delawarensis, L. argentatus*) but a passing locomotive startled the flock into flight minutes later. The two Ivory Gulls circled and settled back on the ice, but all other birds in the flock departed. In flight the long, pointed, white wings and white mantle were noted; the wing-beat was rapid and tern-like. After settling, one bird walked to the open water and apparently drank there.

The gulls were about 50 yards from shore and observations were made from an elevated position on the bank, below Woodland Cemetery. The study was carried out in bright sunlight, with the aid of a 20-power spotting telescope on a tripod and binoculars.

The arrival of these rare stragglers, seldom seen away from their Arctic pack ice, was of great interest to local ornithologists, many of whom reported the presence of one or more Ivory Gulls around the same date.—Eric Walter Bastin, *43 Inglewood Drive, Hamilton, Ontario, Canada, January 15, 1953.*

Cassin's Sparrow in Cleveland County, Oklahoma.—On November 21, 1952, in the South Canadian River bottomlands just west of the town of Noble, Cleveland County, Oklahoma, I saw a small sparrow atop one of the small, shrubby trees lining the river bed. I collected the bird, which seemed reluctant to fly, finding it to be a Cassin's Sparrow (*Aimophila cassini*). It was an immature (the skull was incompletely ossified) female in extensive molt. I wish to describe the plumage in detail for little has been written about the molt of this species.

The flight feathers are molting symmetrically on both sides, and the major tracts of the body are studded with pin-feathers. The first three primaries and their coverts are old, worn, and brownish-gray edged with tan. They are noticeably different from the inner six primaries and their coverts, and the tertials, all of which are dark gray edged with light brownish gray. The fourth and ninth primaries (counting from the outside) are considerably shorter than the others. The tail is markedly graduated, the longest rectrices being the two innermost pairs. These four feathers are still sheathed at the base; the longest falls one millimeter short of the lowest tail measurement given by Ridgway (1901. *U.S. Natl. Mus. Bull.*, 50:253) for adult females of this species. The fourth pair of rectrices (counting from the outside) are about midway in length between the longest and the third pair. The latter are about one-half as long as the median four. The second pair of rectrices are about midway in length between the third pair and the outer-most pair which are as long as the upper tail coverts.

This bird was probably in a normal postjuvenal molt, for according to Phillips (1951. *Wilson Bull.*, 63:324) the species molts rather late. Swarth (1908. *Condor*, 10:114) states that an immature female taken by him in Arizona on October 26 was in the midst of a molt, covered with pin feathers, and that other Cassin's Sparrows which he observed during the first week in November were quite as ragged in appearance. It is interesting that this molting bird should be found in late November in central Oklahoma, for the species has previously been reported only from western Oklahoma (Cimarron, Jackson, and Harmon Counties), where it is reported to breed (Nice, 1931. *Publ. Univ. Okla., Biol. Surv.*, 3 (1):185).—JEAN W. GRABER, *University of Oklahoma, Norman, April 5, 1953.*

Red Crossbill in Oklahoma.—Griscom (1937. *Proc. Boston Soc. Nat. Hist.*, 41:165) stated that there were no records of the Red Crossbill (*Loxia curvirostra*) for Oklahoma. Subsequently the species has been recorded a few times. During the extensive invasion of the plains and eastern states by this species in 1950-51, birds were seen in several north-central localities in Oklahoma (see *Audubon Field Notes*, 1951, 5:4, 27, 192, 214). Dr. F. M. Baumgartner has kindly informed me that, so far as he knows, no specimens were collected in Oklahoma during this invasion.

It therefore seems worthwhile to place on record my notes on this species in the Black Mesa country of Cimarron County, made during a four and a half day collecting trip (November 28 to December 2, 1952) in the vicinity of Kenton.

Though piñon–juniper is the dominant tree growth of the area, there are many fine western yellow pines (*Pinus ponderosa*) about six miles southeast of Kenton on the Regnier Ranch. I encountered crossbills only in the vicinity of these pines. On December 1, I collected one of two males which were sitting quietly (not feeding) in a large pine. The following morning I saw and heard two crossbills flying over, and later in the morning, a single crossbill with a flock of House Finches (*Carpodacus mexicanus*).

My specimen, on the basis of both plumage and skull ossification characters (see Tordoff, 1952. *Condor*, 54:200–201) is an adult. The testes were considerably enlarged (approximately 5 mm. in length). The color is predominantly red, though there are many orangish feathers scattered throughout the plumage. The *brightest* red feathers on the bird are pinkish or rose colored, it being, then, a pale example of the species. It is also a rather large crossbill. Using Griscom's (*op. cit.*:138) system, it measures: wing, 92; tail, 55; culmen, 20; and bill depth, 10 mm.

With an understanding of the possible fallacy of placing a single vagrant crossbill subspecifically, I still feel that it is worthwhile to assign it a trinomial, since the specimen is so decidedly like *benti* in color and size characters. Though the culmen length is slightly over the size range given by Griscom for *benti*, the specimen is easily separable from a good series of Mexican specimens (*stricklandi*), from the Sutton Collection, on the basis of its paler color and smaller bill-depth, characters which should also separate it from *grinnelli*.

The specimen is in the Museum of Zoology, University of Oklahoma. My thanks are due Dr. George M. Sutton for the use of comparative material from his collection and the Oklahoma Collection.—Richard R. Graber, *Museum of Zoology, University of Oklahoma, Norman, February 20, 1953.*

Sharp-tailed Sparrow in Oklahoma.—Although there are several records for the Sharp-tailed Sparrow (*Ammospiza caudacuta*) for the adjoining states of Arkansas (see W. J. Baerg, 1951. *Univ. Arkansas, Agric. Exp. Sta. Bull.* 258, revised) and Kansas (W. S. Long, 1940. *Trans. Kansas Acad. Sci.*, 43:455), this rather secretive species has not been reported from Oklahoma. In the fall of 1952, while collecting for the Oklahoma Biological Survey, I made a concentrated effort to find Sharp-tailed Sparrows.

Due to drouth conditions in Oklahoma in the summer and fall of 1952, marshy places were especially scarce. There were however, a few places along the South Canadian River in Cleveland County which looked as though they would be attractive to marsh-loving birds. These were rather dense stands of three-foot high grasses, actually standing in an inch or two of water. Two grasses, barnyard grass (*Echinocloa crus-galli*) and gray leptochloa (*Leptochloa fasicularis*), were conspicuous in these stands, and in them I frequently encountered Swamp Sparrows (*Melospiza georgiana*) and Long-billed Marsh Wrens (*Telmatodytes palustris*). Though I visited such habitat frequently from mid-September, I failed to find either Sharp-tailed Sparrows or the similarly inconspicuous Leconte's (*Passerherbulus caudacutus*) until October 14. On this date I saw four Sharp-tails (two collected) and three Leconte's (one collected), about a mile west of Noble.

Both of my specimens of *Ammospiza* were fat males with incompletely ossified skulls. Neither resembles at all closely any of the several specimens representing the races *caudacuta*, *subvirgata*, and *diversa* in the Sutton Collection. One (RRG 1881) in a typical dark-backed, generally richly colored example of *nelsoni*; the other (RRG 1880) may also fall within the limits of this form, though it approaches specimens of *altera* collected in the fall at Ithaca, New York, in grayness of back and cheek-patch and in the paleness of ventral streaking. I prefer not to assign a trinomial to this second specimen until I know more about the range of color variation of immature *nelsoni*.

The specimens are now in the Museum of Zoology, University of Oklahoma. I wish to thank Dr. George J. Goodman for his identification of the grasses, and Dr. George M. Sutton for the use of the comparative material in his collection.—Richard R. Graber, *Museum of Zoology, University of Oklahoma, Norman, January 16, 1953.*

Ring-billed Gulls stealing fish from female American Mergansers.—During the 1951-1952 winter, I observed some interesting behavior of Ring-billed Gulls (*Larus delawarensis*) and female American Mergansers (*Mergus merganser*) at the McMillan Reservoir, Washington, D. C.

The gulls were present on the reservoir before the mergansers appeared. After January 3, 1952, when the mergansers first appeared on the reservoir, both species were present frequently and usually at the same time. However, male mergansers were not present after February 1.

I usually watched birds on the reservoir once in the morning, at noon, in mid-afternoon, and again after 5 p.m. I did not notice gulls paying any particular attention to the mergansers until February 4, when a gull attacked and tried to rob a female merganser of a fish it had just caught and was trying to swallow. This incident was re-enacted later on the same day and many times thereafter.

Five was the maximum number of female mergansers present at any one time. Usually one Ring-billed Gull would deliberately trail one or more feeding female mergansers on the water. Ordinarily, the gull would not go into action until a diving merganser surfaced with a fish, at which time, the gull would take flight, circle briefly in the air over the merganser, and then plunge at it in an attempt to rob the bird of its fish. As a rule, only one gull would follow a group of mergansers and would drive away any intruding gull which might settle on the water near the group. However, if other gulls were present, at a distance, they would often take off as a merganser came up with a fish and compete in the game of robbing the diver of its prey. Sometimes the merganser's dive served as the signal for the other gulls to take off and circle slowly in the air over the area where the bird dived or alight on the water near the place where the diver would surface.

Most often, in their efforts to elude the gulls, the mergansers would sprint across the surface of the water, propelling themselves with feet and wings, using their wings more or less as oars by beating the water violently with rapid wing strokes. They would start and stop abruptly as they attempted to evade the attacking gulls. The gulls were persistent, however, and tried repeatedly to rob the fleeing mergansers. The mergansers would dive only as a last resort when a direct hit from a plunging gull seemed imminent.

When a gull successfully wrested a fish from a merganser, it would leave the reservoir, at least temporarily, pursued by one or more gulls bent on robbing it in turn. During my observations, the gulls seldom succeeded in getting fish away from the mergansers.

On February 13, for the first time, I saw a pursuing gull twice force a merganser to take flight with its catch. This performance was repeated on February 19 and 21. Once a pursued merganser circled over most of the reservoir 5 times, landed on the water, and dived to escape one gull but took off again immediately to escape two other gulls that flew in to attack it as it surfaced. This time, the tiring merganser circled the reservoir an additional two and one-half times before it finally dropped its fish which was seized by one of the band of robbing gulls. This reservoir is large enough so that the birds traveled a good distance in their flight.

Until the 13th of February, the mergansers seemed reluctant to leave the water to escape the gulls. Beginning with the 13th, however, they tried to elude the gulls on each occasion by taking flight, and each time, they dropped their fish sooner or later in their flight. I observed the gulls to be more successful in getting fish away from

flying mergansers than when the mergansers remained on the water and dodged, swam, and dived to evade the gulls. The fact that I saw no gulls try to rob mergansers of their fish until after the male mergansers stopped frequenting the reservoir is also of interest.

After February 21, the mergansers came less and less frequently to the reservoir, and I noted no further action involving these birds and the gulls.—DONALD LAMORE, *3C Parkway Road, Greenbelt, Maryland, November 8, 1952.*

Whooping Cranes in Kansas in 1952.—Although the Whooping Crane (*Grus americana*) was once a reportedly common migrant in Kansas, few or no records have been published for the past several decades. In 1952, I was fortunate in acquiring records of two, and possibly seven, of these large cranes in Kansas.

Mr. M. Wayne Willis, wildlife artist residing in Wichita, Kansas, informed me that he saw a Whooping Crane eight miles north and six miles west of Wellington, Sumner County, Kansas, on the afternoon of 23 March, 1952. Mr. Willis observed the crane, with four Sandhill Cranes (*Grus canadensis*), flying over a maize field. The five cranes landed in the maize field, according to Mr. Willis, and began feeding, presumably upon the maize.

On the morning of 31 October, 1952, I was asked to inspect an unidentified bird being held captive in Sharon, Barber County, Kansas. The bird was a crippled Whooping Crane. Two boys from Sharon had found the crane the previous evening in a pasture eight and one-half miles southwest of Sharon. The crane seemed to be in good health, except that its right wing hung so that the tips of the primaries touched the ground.

Federal authorities were notified, and the injured crane was placed in the custody of Mr. John B. Van den Akker, Director, Salt Plains National Wildlife Refuge, Jet, Oklahoma, on the evening of 31 October. The bird died the following day while en route to the Aransas National Wildlife Refuge in Texas. The crane is preserved as a skin and complete skeleton (KU 31198) in the University of Kansas Museum of Natural History.

On 4 November, 1952, Mr. Fritz Zvlonic, a farmer, informed me that he had seen five "big, white cranes" standing in his pasture, which is two miles north and three miles east of Sharon. After questioning Mr. Zvlonic regarding the appearance of the birds, I am fairly certain that they were Whooping Cranes. He accurately described the birds, mentioning the red on the head, generally white plumage, and black wing tips. Mr. Zvlonic was uncertain as to the date on which he had observed the alleged cranes, but estimated it as 20 October, 1952.

The localities where Whooping Cranes were reported in 1952, in Kansas, are of approximately equal latitude (37° 15′ N). The Sandhill Cranes arrived at this latitude on or about the same dates; in 1952, I observed flights of Sandhill Cranes three miles north and one mile east of Sharon, Kansas, on 30 March, and on 19 and 31 October.—THANE S. ROBINSON, *Biological Survey of Kansas, University of Kansas, Lawrence, January 22, 1953.*

Cinnamon Teal and Avocets in Florida.—On March 8, 1953, we saw one adult male Cinnamon Teal (*Anas cyanoptera*) on Lake Alice at Gainesville, Alachua County, Florida. It was with a large flock of Blue-winged Teal (*Anas discors*), Shovellers (*Spatula clypeata*), and Gadwalls (*Anas strepera*). There are apparently only two

published records of this species in Florida, although Thomas W. Hicks tells us he observed single males of this species in the winter several years ago on the St. Johns River at Jacksonville, Duval County, and on Reedy Lake at Frostproof, Polk County.

On the morning of February 15, 1953, we observed two Avocets (*Recurvirostra americana*) at Cedar Key, Levy County, Florida. The birds were resting on a sandspit along the causeway connecting the key with the mainland, along with several Willets (*Catoptrophorus semipalmatus*), Forster's (*Sterna forsteri*), Royal (*Thalasseus maximus*), and Caspian (*Hydroprogne caspia*) terns, Western Sandpipers (*Ereunetes mauri*), and Brown Pelicans (*Pelecanus occidentalis*).

All during the previous night exceptionally high winds were blowing in from the Gulf of Mexico. These winds probably accounted for the Avocets' presence so far east. When we attempted to frighten the birds from the sandspit, they were unable to make any headway into the wind. This appears to be the third record of Avocets on the west coast of Florida, and one of less than a dozen records for the state.—Dale W. Rice and Edward L. Mockford, *Biology Department, University of Florida, Gainesville, March 18, 1953.*

Smith's Longspur: an addition to the Louisiana list.—On December 13, 1952, while walking across the old Municipal Airport, located just north of Shreveport, Louisiana, in a section of Bossier Parish lying west of the Red River, I flushed a single Smith's Longspur (*Calcarius pictus*). I was able to recognize it by the combination of its typical longspur "clicking" call notes and its pipit-like tail-pattern. Although I flushed it several times and covered a considerable part of the area, no other individuals were found that day. There are no previous records of the Smith's Longspur in Louisiana.

One week later I returned to the airport and soon flushed a flock of about 35 birds of this species. On the following day, December 21, I collected a female from the flock; it is now in the collection of the Museum of Zoology, Louisiana State University. The flock remained in the area for several weeks and was augmented with additional birds for a short period in January. I was able to make an almost exact count of the flock while it was in flight on January 25, 1953; there were 45 or 46 birds present, which seemed to be the peak of their numbers here. By February 22 the flock numbered about 33, and on March 1 only 10 longspurs remained. I next visited the airport on March 8, but was unable to find any birds of this species.

During the course of my visits to the area, it became apparent that the Smith's Longspurs showed a strong preference for a small part of the airfield which had a dense growth of a particular kind of grass that occurred only sparingly on the remainder of the field. Richard K. Speairs, of the Botany Department of Centenary College, has informed me that this grass is a species of *Aristida*. This provided such dense cover that I was seldom able to see the birds until after they flushed.

This airport has not previously been searched by a bird student in winter. In view of the considerable number of Smith's Longspurs which occurred in this one area, particularly in the month of January but also through a good part of the winter, and since the species was found in December, 1951, at Lonoke, Arkansas (Coffey, *et. al.*, 1952. *Audubon Field Notes*, 6:138), it seems likely that the Smith's Longspur will prove to be of regular occurrence in winter, at least in small numbers, in the northwestern corner of Louisiana.—Horace H. Jeter, *4534 Fairfield Avenue, Shreveport, Louisiana, March 26, 1953.*

Direct observation of the flight speed of the Common Loon.— In March, 1948, while flying a Piper Cub J–3 about 17 miles north of Charlotte, North Carolina, and 3 miles east of the Catawba River, at an altitude of 1200 feet, I sighted a Common Loon (*Gavia immer*) crossing diagonally in front of the plane at a distance of about 50 yards—a distance at which the identification of the summer plumaged bird was unquestionable. I immediately turned to follow the loon, which went into a shallow dive (about 15 degrees). Although full throttle was given the plane, the loon was slowly pulling away when such a low altitude was reached that the chase had to be abandoned. The indicated air speed of the plane during the first part of the shallow dive (45 to 60 seconds) was 90 miles per hour. During this period the distance between the loon and the plane remained approximately constant or increased slightly. The airspeed indicator of the plane was checked and proved to be accurate within plus or minus 10 miles per hour at that speed. It may thus be concluded that the true air speed of this loon while being pursued was approximately 80 to 100 miles per hour.—JAMES A. PITTMAN, *Massachusetts General Hospital, Boston 14, Massachusetts, February 24, 1953.*

EDITORIAL

The 11th International Ornithological Congress, presided over by Sir Landsborough Thomson, London, will be held in Basel (Switzerland) from May 29 to June 5, 1954.

During the week of the Congress, 5 days will be devoted to meetings and 2 to excursions. Before and after the Congress (May 25–28 and June 7–19) excursions will be arranged to enable members to become acquainted with the Swiss avifauna, especially of the Alps and Lower Alps. The Congress fee is 30 Swiss francs.

The prospectus, containing registration forms and detailed information, has been distributed. Applications to attend, and to contribute scientific papers, should be sent in before February 28, 1954, and addressed to:

11th INTERNATIONAL ORNITHOLOGICAL CONGRESS
ZOOLOGICAL GARDEN, BASEL, SWITZERLAND,

which is at disposal for any inquiries needed.

The International Committee for Bird Preservation will have its 9th International Conference at Scanfs, Lower Engadine, Switzerland on May 23–28, 1954. The program has been planned to permit attendance, without conflict, at both this meeting and the 11th International Ornithological Congress, announced above.

The Southwestern Association of Naturalists was formed at an organizational meeting attended by fifty-two persons at the University of Oklahoma Biological Station at Lake Texoma on May 23, 1953. As stated in the constitution, "The object of the Association shall be to promote the field study of plants and animals, living and fossil, in the southwestern United States and Mexico, and to aid the scientific activities of its members." SWAN hopes to stimulate the study of the region by bringing together persons of like interests through publication of annotated membership lists, annual meetings, and perhaps later through the publication of a journal.

The officers elected for the first year were: W. Frank Blair (Vertebrate Zoology), University of Texas, *President*; George J. Goodman (Plant Taxonomy), University of Oklahoma, *Vice-President*; Herndon G. Dowling (Herpetology), University of Arkansas, *Secretary-Treasurer*. The geographic scope of the Association at present includes Mexico and the states of Arizona, Arkansas, Kansas, Louisiana, New Mexico, Oklahoma, and Texas. Persons interested in the natural history of this region are invited to join the Association. Membership blanks may be obtained from any of the officers.

Dr. Charles G. Sibley has recently taken up the duties of his new position teaching ornithology at Cornell University.

Robert M. Mengel is now at the University of Kansas where he is engaged in a bibliographic study of the Ralph M. Ellis natural history library; Mengel is also completing his study of the birds of Kentucky for the doctorate from the University of Michigan.

ORNITHOLOGICAL LITERATURE

PARENTAL CARE AND ITS EVOLUTION IN BIRDS. By S. Charles Kendeigh. Illinois Biological Monographs (vol. 22, nos. 1–3), University of Illinois Press, Urbana, 1952: 7 × 10¼ in., 356 pp. $4.00, paper; $5.00, cloth.

Lest this volume be accepted at its face value, it is necessary to examine it critically. It is an outcome of the well known House Wren work of Dr. Kendeigh at the Baldwin Bird Research Laboratory, especially that of mechanical recording of birds' visits to nests, plus information on the entire Class Aves carded by student assistants at the University of Illinois. The mélange is not a happy one.

After a brief description of methods, 79 pages are devoted to the House Wren, especially details of its visits to the nest in relation to nest building, clutch size, laying, incubating, feeding and brooding, illustrated with charts and tables of individual records. Similar, but shorter records from Ohio, with more details from the literature on 19 other species, from Killdeer to Song Sparrow, occupy the next 80 pages. These sections are mines of information on detailed activities at the nest, and will be a constant source of reference for students of bird behavior.

The author claims, of the 105 pages devoted to a survey of parental care: "The present summary should bring information on parental care up to date to the year 1950." But it is so sketchy and misleading that it is not even an important guide to the literature. One would gather the impression that practically nothing was known about whole groups of birds for which there is considerable information. This is best shown by some examples.

The family Nectariniidae (sunbirds), of some 104 species, is not listed by Kendeigh, though one species is mistakenly listed under Dicaeidae (flower-peckers) with only the statement that both sexes build and incubate. Checking the few references listed below, the following composite picture based on 16 species of Nectariniidae is possible: nest a pensile structure (usually), or a half oval sewed tailor-bird fashion to the underside of a large leaf; eggs 1–3; nest-building by female only (11 species), female accompanied by male on trips (6 species), and by male and female together (3 species); nest-building prolonged, with periods of days when birds are absent; duration of construction more than 22 days (1 species), 3–5 weeks (1 species), 30 days (1 species), but may be as short as 13 days (1 species), or 7 days for a second nest (1 species); trips to nest during construction made very quickly: 4 trips in 30 minutes and 27 trips in 29 minutes (1 species), 9 trips in 10 minutes (1 species), 14 trips in 60 minutes (1 species); one working day 10 a.m. to 3 p.m. (1 species); egg laid 8 a.m. (1 species); incubation period 12, 13 days (1 species); incubation by female only (8 species), the incubating female visited by male (1 species) or accompanied by male when off eggs (1 species), or incubation by male and female (2 species); young fed by female only (1 species) or by both male and female (4 species); trips with food at 3 minute intervals (1 species); 4–5 insects carried each trip (1 species). References: Baker, 1934, "The nidification of birds of the Indian Empire," Vol. 3, pp. 208–235; Bannerman, 1948, "The birds of tropical West Africa," Vol. 6, pp. 151–193; Cowles, 1936, *Auk*, 53:28–30; Moreau and Moreau, 1937, *Ibis*, 79:336; North, 1907, "Nests and eggs of birds . . . Australia," Vol. 2, p. 208; Potter, 1948, *Wilson Bulletin*, 60:159–163; Rand, 1942, *Bull. Amer. Mus. Nat. Hist.*, 79:354; Vincent, 1949, *Ibis*, 91:327–335.

Of the families that are included, some are very inadequately treated; for example: *Meliphagidae*.—Of the 160 known species Kendeigh has data, incomplete, on only

two species, one Australian and one New Zealand, with only the following data: female builds and incubates, leaving nest to feed; eggs 2; incubation and nesting period 18 days (1 species); both male and female incubate and feed (1 species).

From only two recent sources (Serventy and Whittell, 1948, "Birds of Western Australia," pp. 313–331; Rand, 1942, *Bull. Amer. Mus. Nat. Hist.*, 79:356, 358), it is possible to add the following composite picture based on 14 species: nest a cup or a pensile oval; eggs 1–4; nest building takes 4 days (1 species); female alone builds (3 species), making trips at 5 minute intervals (1 species), accompanied by the male (1 species), both male and female build (2 species); incubation period 14 days (1 species), less than 13 days (1 species); female alone incubates (3 species); both male and female incubate (2 species); nestling period 14, 15 days (2 species); both male and female feed young (3 species); in 70 minutes male fed 5 times, female 5 times (1 species); both male and female brooded young (1 species).

The lack of adequate coverage is indicated by the fact that such authors of standard source books for the birds of Africa as Bannerman, Jackson and Sclater, and Sclater; of southern Asia as Stuart Baker and La Touche; and of Australia as Campbell, North, Mathews, and Serventy and Whittell, are not even mentioned in the bibliography.

Species are sometimes misplaced in families, for example for the family Prionopidae Kendeigh gives data on 5 genera. Of these five, 3 belong in other families: *Grallina* in Grallinidae, *Hemipus* in Campephagidae, and *Colluricincla* should join *Pachycephala* which Kendeigh has placed in the Muscicapidae.

The understanding of the known, detailed facts for a few species in a family in relation to the less well known behavior of most of its species is poor. This is best shown by the Paradiseidae (43 known species). Kendeigh quotes my studies at the nests of two species in which apparently male and female pair for the whole reproductive period. But he does not point out that these are exceptions in the family in that the male and female are alike, while extreme specialization of the male in plumage ornamentation and display is characteristic of this group. Probably in most species the males have nothing more to do with reproduction after mating with the females at the display grounds. Here, too, a bower bird should have been placed in the family Ptilonorhynchidae, which is not otherwise represented.

That a table showing "average" behavior by families has value, I doubt. Usual behavior, with variations, is something else, but judgment rather than addition and division becomes important here. This is particularly apparent in the birds of paradise (p. 286), mentioned above.

The concluding section is devoted to discussion. The thesis that habits are a good guide to relationships is accepted, and that the primitive condition in parental care is for each parent to take an equal part. Certain trends are pointed out, such as a tendency toward more nest duty by the males in the Palaeognathae; a tendency toward more nest duty by the females in the Passerines; a general tendency toward shorter incubation and nestling periods, and toward shorter and more frequent attentive periods in highly evolved groups.

Groups are variable within themselves and similar behavior has reappeared, probably independently, in many groups. It seems to be implied, based on faith rather than evidence, that order, family, genus, species and subspecies have progressively less differentiated types of behavior. The last few pages are devoted to parental care in the animal kingdom, with 8 lines devoted to contrasting primitive and civilized man.

Obviously, justice has not been done to the subject. This is due in part to the failure to collect the available data. It is also due to the difficulty inherent in drawing con-

clusions from such a small segment of such a very specialized complex of behavior patterns as birds' reproduction. Attentiveness at the nest, besides being affected by weather and individual variation, as pointed out by Kendeigh, should be correlated with courtship and display which precedes it, and with the condition of the young and their survival which follows it.

In the present study as a whole, as the subjects become more removed taxonomically from the House Wren, and their ranges become more removed geographically from Ohio, the value of the paper decreases.—A. L. RAND.

FINDING NESTS. By Bruce Campbell. Collins, St. James' Place, London, 1953:5 × 7½ in., 256 pp., 40 black and white photos. $1.76 (12s. 6d.).

The author of this first modern book devoted to techniques of finding nests states, in typically British manner, that the book "is an attempt to reinstate the finding of birds' nests as an important adjunct to ornithology as well as a wonderful sport in its own right." He adds: "I could not count the number of times I have heard competent field ornithologists explain, with a mixture of pride and shame in their tone: 'Of course, I'm hopeless at finding nests.' This has always sounded strange to me; . . . to discover how and why each species selects its nest-site, and to observe how each species visits the nest during its period of use ought to be integral parts of any study of bird behaviour."

Part One of "Finding Nests" contains three introductory chapters: "Why find nests?," "Methods of nest finding," and "Looking at nests." These chapters describe general techniques, well known to many field ornithologists, for finding and gaining access to nests, but which, for the most part, must be learned by personal experience. It is a delight to read these short chapters with their specific suggestions for locating nests.

The remainder of the book (12 chapters) is devoted to 222 species of birds, 184 of which regularly breed in the British Isles. For each of the regular breeding species, there is a concise statement on breeding distribution, the breeding season, habitat, nest-site, nest-composition, and methods for finding the nests. In addition, each chapter is prefaced by a short introduction which describes the similarities and differences between the species covered, and, where possible, indicates general methods of nest-finding applicable to certain groups. These introductory comments are especially interesting and revealing to one who has not been privileged to observe Reed-Warblers (*Acrocephalus scirpaceus*) or Spotted Flycatchers (*Muscicapa striata*) in the field.

The 40 excellent black and white photographs of nests, nest-sites, and adults at the nest add immeasurably to the value of the book.

Probably no one individual is qualified to write a similar book on the breeding birds of the United States or even of one quarter of the country. Such a book authored by several workers, however, undoubtedly would serve as a considerable stimulus to obtain more specific information on many poorly known species—note the dearth of information on many of the American warblers (*cf.*, A. C. Bent, *U. S. Natl. Mus. Bull.* No. 203, 1953). Judging from Mr. Campbell's comments on British birds, the nests of some American birds must be much easier to find. Many nests of the American Goldfinch (*Spinus tristis*), for example, can be found after one learns the "warbling" call of the female given from the nest during the building period as well as during incubation. Similarly, finding the nest of our Warbling Vireo (*Vireo gilvus*), which sings while incubating, frequently is but a matter of locating the singing bird. The loud and persistent food call of the nestling Cowbird (*Molothrus ater*) is also an excellent guide to nests of the hosts.

In the last analysis, there are two prerequisites for finding birds' nests: (1) a genuine interest in nests, and (2) a knowledge of preferred nest-sites. Mr. Campbell notes that:

"If energy and persistence are required to find nests by searching, the key quality in watching back [*i.e.*., watching the adult bird return to the nest] is patience, but as this is the key quality in real bird-watching—as opposed to 'bird-snatching,' the mere pursuit of rarities—it is presumably one which readers of this book already possess."

Mr. Campbell also states that "it is in a knowledge of the likely sites for each species that success in nest-finding lies: the breeding habitat is no more than a general guide. How far such knowledge can be acquired except by personal experience or instruction in the field I admit I am not sure. . . ." He adds further that "the chances of success in all types of searching are much increased if you know what you are looking for; this sounds obvious, but what I mean is that the more nests of the chaffinch you find, the better your mental picture of the 'ideal' chaffinch's nest," and "after a time the eye travels automatically to the likely sites in any habitat. I shall do my best to describe these . . . , but the eye can only be trained in the field."

Mr. Campbell's book is highly recommended to all American ornithologists, professional and amateur, who are interested in "training their eyes" to see birds' nests.—ANDREW J. BERGER.

NEUE ERGEBNISSE UBER DIE ERNAHRUNG DER GREIFVOGEL UND EULEN (New contributions on the food of hawks and owls). By Otto Uttendörfer. Published by Eugen Ulmer, Stuttgart, z. Z (14a), Ludwigsburg. 1952:6 × 8¾ in., 230 pp. (DM12).

This is a compilation, apparently, of all known information on the food of European hawks and owls up to the end of 1946, but important literature subsequent to that date is also cited. Several ornithologists in addition to the author contributed new data, and there are special discussions, credited to R. Kuhk and G. Bodenstein, in the book. The author's face is depicted in a drawing by H. Meissel and recognition marks of hawks and owls in flight are shown on three pages of drawings by Franz Murr.

Extensive data, many of them quantitative, obtained from observations at nest-sites and from stomach analyses are given for 35 species of falcons, hawks, eagles, and vultures and 14 species of owls. American literature is included for those species occurring in both continents. There is a useful summary also of the various species of hawks and owls that attack each species of prey. No serious attempt is made at analyzing the dynamics of predation or the effects of predation on prey populations, but for what it was intended the book is a useful source of information.—S. C. KENDEIGH.

SEARCH FOR THE SPINY BABBLER . . . AN ADVENTURE IN NEPAL. By Dillon Ripley. Houghton Mifflin Company, Boston, 1952:5⅛ × 8⅜ in., xiv + 301 pp., 18 photographs. $4.00

This is a popular account of Dr. Ripley's most recent expedition to Nepal. He begins with a general discussion of this little known Asiatic kingdom, touching on topics such as geographic position, history, politics, topography, and wildlife. This introduction to the main body of his narrative is of interest to the reader as comparatively little is known about this enigmatic kingdom.

Few outsiders, not to mention naturalists, have ever been inside Nepal. Dr. Ripley and his associates on the expedition were fortunate indeed. They were allowed by the king of Nepal to journey to the capital city of Katmandu. Once in Katmandu they had to obtain permission to visit the interior. The fact that they got this permission is now history but what a gamble it was! If they had not succeeded they would have traveled thousands of miles for nothing.

For years Nepal has remained virtually unknown to ornithologists. The only really extensive work prior to that of Dr. Ripley was done by an Englishman, Brian Hodgson. He, a clerk in poor health working for the British East India Company, was given the choice either of dying at home in England, or in the hills of Asia. He chose to remain and was appointed to assist the Resident placed in the court at Katmandu by the East India Company. Here Hodgson lived and thrived and became an outstanding student of Nepalese ornithology, other branches of natural history, ethnology and linguistics. He succeeded the Resident and remained in Nepal from 1821 to 1843. During this period he recorded 563 species of birds, most of which were brought to him by native collectors, foreigners not being allowed beyond the Katmandu valley. He described 150 of these species for the first time and usually gave the type locality merely as "Nepal." Much of Hodgson's material has now became useless or nearly useless because of "foxing" or through actual loss of specimens.

Nepal, lying lengthwise as it does, along the foothills and in the southern Himalayas, is a critical area in regard to avian distribution. This general area is the meeting place of the Burmese-Malayan tropical faunal elements with the Palaearctic faunal elements from the north. This is one of the reasons Dr. Ripley is so interested in the area, another being the fact that many of the birds that Hodgson reported had not since been recorded from Nepal. Among these were the Spiny Babbler, *Acanthoptila nipalensis*, and the Mountain Quail, *Ophrysia superciliosa*. Ripley found the Spiny Babbler, "whereby hangs the tale," but not the Mountain Quail. This latter bird may be extinct through destruction of its habitat, which leads us to a more sordid aspect of Nepalese conditions.

Ripley noticed the appalling misuse of land, a practice which is apparently increasing. He also noticed that many areas, which were in good condition just a few years previously, were ruined or being ruined. The lovely, wooded hills which lend so much to the scenic and scientific charm of India and Nepal are in many cases being denuded of their forest cover and tilled for crops. This practice leads to the rapid loss of soil during the torrential rains and results in subsequent arid sterility with a lowering of the water table, where once there had been green hills.

A refreshing note, in contrast to the account of the encroachment of "civilization" and the misuse of a beautiful land, was Dr. Ripley's poignant description of the pretty, little, remote mountain village of Dhamkuta. His description of this village is delightful. He has, I think, succeeded here in inspiring a feeling of near-nostalgia for a place very few of us have ever been to.

Dr. Ripley's narrative, for the most part, is vivacious and crammed with amusing, exciting, and sometimes exasperating incidents met with on his travels into the Katmandu valley and thence to western, and finally eastern, Nepal. Those of us who have been to the Far East can read with amusement the exasperating incidents involving uncooperative bearers and the like. Refrains such as "They are taking food, sir. They are just now coming" are probably most fully appreciated by those who have had the opportunity to experience them. The tale is told with feeling and a sensitivity which is to be admired. However, I had some difficulty keeping track of the time when certain happenings were taking place, because of the author's failure to give dates. This was a mild annoyance indeed, far overbalanced by the over-all excellence of the story telling.

Of course, as I have mentioned, the book is primarily a popular one and no great deal of ornithological information is incorporated. Dr. Ripley's party collected around 1600 bird specimens along with about 200 mammals. The bird specimens collected represented 331 species and subspecies. About 50 more species were identified in the field but not

collected. Dr. Ripley has indicated that, judging from subsequent study since the expedition's return, the faunal break between the tropical and palaearctic faunas takes place in eastern Nepal in the region of the Arun Kosi river valley.

Besides the text, the book contains end-paper maps and a bibliography of books about Nepal published in recent years.—W. C. DILGER.

LETTING UNCLE SAM DO IT

A contribution from the Wilson Ornithological Club Conservation Committee

Some recent actions by the 1953 General Assembly of the State of Indiana should be of general interest, not because of their approach to wildlife conservation problems, but because of the broader implication for conservation philosophy. A bill for repeal of veterans' free hunting permits was defeated. Also defeated were several bills for taking the Conservation Department out of politics. However, a bill providing for a statewide fox bounty was passed and promptly became law. No other conservation bills of major importance were acted upon.

The actions of this legislature have deprived a major segment of Indiana's sportsmen from personal participation in conservation—at least so far as their license dollar might go in wildlife's behalf. There is no good reason why every sportsman should not pay his own way. But proponents of repeal of the free hunting permits stressed that more licenses sold would automatically mean more federal aid money through Pittman-Robertson funds, and, *a priori*, more and better hunting and fishing in Indiana. Defeat of this bill by hasty politics merely postponed further attempts for two years when the Assembly will meet again. Meanwhile enough energy was spent in the last two years' campaigning for repeal to have planted a million pine trees; but no one thought of planting pine trees. The real point is that legislators, administrators, and John Q. Citizen seem more willing to bet their stake on continuing federal help than on developing a program wherein each person has a part to play.

This lack of individual responsibility for wildlife conservation is again reflected by passage of a fox bounty law. The only premise of this law reads, "Foxes are hereby declared to be detrimental to the wild life of the State . . . ." This legalistic declaration is contrary to the findings reported by the Indiana Pittman- Robertson Wildlife Research Project which showed that county fox bounties paid from 1875 to 1948 had no demonstrable effect upon fox populations. Fox food habits studies by the same project failed to show that foxes limit Indiana quail and rabbit populations. Some other states have handled their predator problems with trapper-trainee programs which placed the responsibility on the landowner by making him a participator. Ironically, some legislators who ignored Pittman-Robertson research findings in voting for the bounty in Indiana also voted for repeal of the veterans' permits. A vote for repeal was in effect a vote for more federal aid! The lack of a consistent conservation policy is not unique to Indiana for all too widely there is a growing tendency to "let Uncle Sam do it"—and then ignore research facts stemming from his aid, even when these facts are desperately needed in establishing state legislation. In spite of the vast accumulation of technical knowledge gained through the P-R program, Michigan, Wisconsin, and many other states continue their fox bounties as a means of "control."

It is really not so amazing that we have failed to arouse public sentiment to challenge questionable legislative actions. Annual contacts with 4-H youth and adults in conservation camps by one of the authors show that in general the youngsters and teachers share the same beliefs about wildlife: a widespread opinion that game and fur species alone are valuable or worthy of conservation. Predators and non-game species are commonly unknown or despised, and the principles of ecology and wildlife conservation are rarely understood. On the other hand, nearly all seem to be familiar with game farming and to everyone the words "Pittman-Robertson" have a familiar ring. The tragedy is that something basic is still lacking.

Leopold had a phrase for it—"ecological conscience." In explanation he wrote, "The only progress that counts is that on the actual landscape of the back forty, and here we are slipping two steps backward for each stride forward . . . .

"We have not asked the citizen to assume any real responsibility. We have told him that if he will vote right, obey the law, join some organization, and practice what conservation is profitable on his own land, that everything will be lovely; the government will do the rest.

"The formula is too easy to accomplish any thing worthwhile. It calls for no effort or sacrifice; no change in our philosophy of values. It entails little that any decent, intelligent person would not have done of his own accord . . . ." (Bulletin of the Garden Clubs of America, September, 1947).

Can we rely solely upon federal help to develop in our people an ecological conscience? Is this a place to "let Uuncle Sam do it"? We believe not. And this is in spite of the fact that P-R funds have provided the greatest impetus for wildlife research and development that this country has ever enjoyed. Their accomplishments are both spectacular and essential. A mere glance into the annual reports invites the wonder of any sportsman. Gratifying benefits are received as well by non-game species from land acquisition and management. Any student can aspire to be a P-R project leader or become known as an expert on one or another species. But this is the question we would like to raise, "Is federal aid substituting for individual thought and action?" Along with the patches of restored habitat and reams of slick paper publications are today's sportsmen and youth also made aware of the need for their personal activity? Or do they, from sheer volume of money spent, projects completed, and publications listed, think federal aid and wildlife conservation are synonymous? In short will they be "for" conservation but against participation as long as Uncle Sam can do it?

In our own minds, in those of our teachers and leaders, and in those of our children we must guard against substituting subsidy for an ecological conscience.—Charles M. Kirkpatrick and William H. Elder.

Wilson Ornithological Club members will be pleased to note the remarkable growth of the Club Library during the past year. Very generous gifts from Dr. H. Lewis Batts and Dr. W. Powell Cottrille to the Book Purchase Fund enabled us to buy a number of newly published books and to fill in certain important gaps of long standing (for example, we now have all four parts of "Birds of the Lake Umbagog Region" by Brewster). A total of seventy-nine members donated books, reprints, pamphlets, and magazines during the year. Worthy of special notice are the large gifts of books received from Albert E. Greene, Karl W. Haller, Rosario Mazzeo, and Winsor M. Tyler. These gifts included a number of the standard reference volumes—Bonaparte, Chapman, Coues, Forbush, Ridgway, Roberts, Taverner, Todd—which are fundamental to serious bird study and essential to any bird library.

BOOKS: List B-1

Books added to The Wilson Ornithological Club Library since the publication of Complete List 2 (*Wilson Bulletin*, 64, No. 3, September 1952:176-185).

Bendire, C., Life Histories of North American Birds. (2 vols.) 1892-1896.

Blake, E. R., Birds of Mexico. 1953.

Blyth, Edward, and W. B. Tegetmeier, The Natural History of the Cranes. 1881.

Bonaparte, C. L., American Ornithology; or the Natural History of Birds Inhabiting the United States. (vols. 1, 2, 3) 1825-1828.

Brandt, Herbert, Arizona and Its Bird Life. 1951.

Cayley, N. W., The Fairy Wrens of Australia. 1949.

Chapman, F. M., Handbook of Birds of Eastern North America. (4th ed.) 1897.

Chapman, F. M., The Warblers of North America. 1907.

Coues, Elliott, Key to North American Birds. (4th ed.) 1890.

Davie, Oliver, Nests and Eggs of North American Birds. (5th ed.) 1900.

Dekay, J. E., Zoology of New York, or the New York Fauna. Part II. Birds. 1844.

Dwight, Jonathan, Jr., The Ipswich Sparrow (*Ammodramus princeps* Maynard) and Its Summer Home. 1895.

Forbush, E. H., Birds of Massachusetts and other New England States. (3 vols.) 1929.

Grosvenor, G., and A. Wetmore (eds.), The Book of Birds. (2 vols.) 1937.

Hann, H. W., The Biology of Birds. 1953

Hausman, L. A., The Illustrated Encyclopedia of American Birds. 1944.

Hollom, P. A. D., The Popular Handbook of British Birds. 1952.

Jefferies, Richard, Wild Life in a Southern County. 1879.

Joy, N. H., How to Know British Birds. 1942.

Koford, C. B., The California Condor. 1953.

Mayr, Ernst, Birds of the Southwest Pacific. 1945.

Miller, Alden H., An Analysis of the Distribution of the Birds of California. 1951.

Morgan, A. H., Field Book of Animals in Winter. 1939.
Mudie, Robert. The Feathered Tribes of the British Isles. (2 vols.) 1853.
Nuttall, Thomas. A Manual of the Ornithology of the United States and of Canada. Land Birds. 1832.
Pearson, T. G. (ed.-in-chief), Birds of America. 1936.
Peters, H. S., and T. D. Burleigh, The Birds of Newfoundland. 1951.
Peterson, Roger T., A Field Guide to Western Birds. 1941.
Pettingill, O. S., Jr., A Guide to Bird Finding East of the Mississippi. 1951.
Raine, Walter, Bird-nesting in North-west Canada. 1892.
Ridgway, Robert, The Birds of North and Middle America. Part 7. 1916.
Roberts, T. S., The Birds of Minnesota. (2 vols.) 1932.
Samuels, E. S., Our Northern and Eastern Birds. 1883.
Shiras, George, 3d., Hunting Wild Life with Camera and Flashlight. (2 vols.) [1935].
Shortt, T. M., and Sam Waller, The Birds of the Lake St. Martin Region, Manitoba. 1937.
Sprunt, Alexander, Jr., and E. B. Chamberlain, South Carolina Bird Life. 1949.
Stoner, D., and L. C. Stoner, Birds of Washington Park, Albany, New York. 1952.
Sutton, G. M., The Birds of Southampton Island. 1932.
Taverner, P. A., Birds of Canada. 1934.
Thomson, A. L., Bird Migration: A Short Account. 1943.
Todd, W. E. C., Birds of Western Pennsylvania. 1940.
Townsend, C. W., The Birds of Essex County, Massachusetts. 1905.
Wright, H. W., The Birds of the Jefferson Region in the White Mountains, New Hampshire. 1911.

THE WILSON ORNITHOLOGICAL CLUB LIBRARY

The following gifts have been recently received. From:

Andrew J. Berger—21 reprints
Herbert Bruns—2 reprints
William H. Burt—4 reprints
L. C. Finneran—1 pamphlet
Albert E. Greene—23 books
Karl W. Haller—3 books, 6 reprints
Harry W. Hann—1 book
Hildegarde Howard—1 reprint
Philip S. Humphrey—5 reprints
Leon Kelso—2 books, 24 magazines
Karl F. Lagler—5 reprints
Louise de Kiriline Lawrence—1 reprint
Ernst Mayr—15 magazines
Russell E. Mumford—1 reprint
Margaret M. Nice—6 reprints
Donald J. Nicholson—4 reprints
William H. Phelps—4 reprints
Georg Steinbacher—3 reprints
Winsor M. Tyler—3 books
University of Wisconsin Department of Wildlife Management—3 reprints
J. Van Tyne—1 book
Harry H. Wilcox—1 reprint

PROCEEDINGS OF THE THIRTY-FOURTH ANNUAL MEETING

BY PHILLIPS B. STREET, SECRETARY

The Thirty-fourth Annual Meeting of the Wilson Ornithological Club was held at the University of Michigan Biological Station on Douglas Lake, near Cheboygan, Michigan, from Sunday, June 14, to Wednesday, June 17, 1953. It was sponsored by the University of Michigan and the Michigan Audubon Society.

There were four sessions devoted to papers, three evenings of motion pictures, and two business meetings. A meeting of the Executive Council was held on Sunday evening, June 14, and a motion picture, "South to Siesta Land," by Fran William Hall, was shown at the same time, followed by two of the Walt Disney True-Life Adventure Series. The Annual Dinner was held on Monday evening, with First Vice-President Burt L. Monroe delivering the address in the absence of President Breckenridge. Olin Sewall Pettingill, Jr., showed his new film, "Tip o' the Mitten," based upon summer studies at the Biological Station, and it was followed by a film on the life-history of the Bob-white Quail, by Charles W. Schwartz. On Tuesday evening, the staff of the Biological Station and the officers and members of the Michigan Audubon Society were hosts at an informal reception, following the motion picture session.

Early-morning field trips were held on Tuesday morning to nearby Reese's Bog and to Kirtland's Warbler country south of Onaway. All day field trips were held on Wednesday (1) to Kirtland's Warbler country, (2) to Wilderness State Park, and (3) to the Upper Peninsula.

First Business Session

Vice-President Monroe called to order the first general meeting at 9:30 a.m., Monday, June 15. Dr. Alfred H. Stockard, Director of the University of Michigan Biological Station, welcomed the Club to Douglas Lake. The minutes of the 33rd Annual Meeting were approved as published in *The Wilson Bulletin* for September, 1952.

Secretary's Report

The secretary, Phillips B. Street, summarized the principal actions of the Executive Council as follows:

1. Harrison B. Tordoff was unanimously re-elected editor of *The Wilson Bulletin.*
2. The Executive Council accepted the invitation of the Delaware Valley Ornithological Club, the Urner Ornithological Club, and the New Jersey Audubon Society to hold the 35th Annual Meeting at Cape May, New Jersey, on Saturday and Sunday, June 12 and 13, 1954. A meeting of the Executive Council will be held on June 11, and organized field trips will be offered on June 14.
3. An annual contribution of $5 was voted to the International Committee on Bird Protection.
4. The importance of life memberships in building up our endowment funds was discussed at some length, and those who are able are urged to give serious consideration to becoming life members.

Treasurer's Report

The treasurer, Leonard C. Brecher, reported on the finances of the club. The report was approved, subject to the report of the Auditing Committee, scheduled for the following day.

Report of Treasurer for 1952

Balance as shown by last report, dated December 31, 1951		$1,753.91

Receipts

Dues:		
Active	4,050.00	
Sustaining	1,194.00	
Subscriptions to *The Wilson Bulletin*	472.50	
Sale of back issues and reprints of *The Wilson Bulletin*	277.50	
Gifts: Color Plate Fund	100.00	
Publication Fund	593.00	
Miscellaneous	71.43	
Transferred from Endowment Fund (interest on bonds, savings account, research grants, etc.)	221.29	
Contribution to Book Fund	8.00	
Total Receipts		$ 8,741.63

Disbursements

"The Wilson Bulletin"—printing, engraving, and mailing	$5,885.77	
President's Expense—Supplies, postage, etc.	3.10	
Editor's Expense—printing, postage, clerical aid, etc.	140.00	
Secretary's Expense—printing, postage, etc.	115.41	
Treasurer's Expense—printing, postage, clerical aid, etc.	220.66	
Membership Committee Expense—printing, postage, etc.	65.20	
Annual Meeting Expense	67.17	
Purchase of book from Book Fund	3.50	
Bank charges, foreign exchange, corporation papers and miscellaneous expenses	11.40	
Purchase of back issues and reprints	33.43	
Transferred to Endowment Fund a/c Louis Agassiz Fuertes Research Grant	100.00	
Total Disbursements		$ 6,645.64
Balance on hand in Citizens Fidelity Bank and Trust Company, Louisville, Kentucky, December 31, 1952		$ 2,095.99

Endowment Fund

Cash balance in Savings Account, December 31, 1951	$2,047.29	
Received during year:		
Interest on U. S. Bonds and on Savings Account	223.80	
Life Membership payments	445.00	
Transfer of Special Research Grants from checking account	100.00	
Total receipts		$ 2,816.09
Disbursed during year:		
Transferred to checking account (interest on bonds, etc.)	221.29	
Louis Agassiz Fuertes Research Grant payment	100.00	
Bank charges a/c State Tax	2.51	

Purchase of Massachusetts Investors Trust (116 shares @$20.75)	2,407.00	
Total disbursements		$ 2,730.80
Cash balance in Savings Account, December 31, 1952		$ 85.29
*Securities owned***		
U. S. Postal Savings Coupon Bonds dated July 1, 1935	$ 780.00	
U. S. Savings Bonds, Series "G", dated September 1, 1943 (maturity value $1,000.00)	973.00	
U. S. Savings Bonds, Series "G", dated September 20, 1944 (maturity value $1,500.00)	1,450.50	
U. S. Savings Bonds, Series "G", dated June 1, 1945 (maturity value $500.00)	482.00	
U. S. Savings Bonds, Series "G", dated July 1, 1945 (maturity value $900.00)	864.90	
U. S. Savings Bonds, Series "G", dated October 1, 1945 (maturity value $1,400.00)	1,345.40	
U. S. Savings Bonds, Series "F", dated February 1, 1947 (maturity value $2,000.00)	1,618.00	
U. S. Savings Bonds, Series "F", dated April 1, 1948 (maturity value $2,000.00)	1,572.00	
U. S. Savings Bonds, Series "F", dated October 1, 1948 (maturity value $1,450.00)	1,125.20	
U. S. Savings Bonds, Series "F", dated April 1, 1950 (maturity value $1,000.00)	754.00	
Massachusetts Investors Trust (116 shares at $20.75 per share)	2,407.00	
Total securities owned**		$13,372.00
Total Endowment Fund		$13,457.29

**Bonds carried at redeemable value December 31, 1952

In reserve:

Louis Agassiz Fuertes Research Grant Fund (special gift)	25.00
S. Morris Pell Fund (special gift)	75.00

Respectfully submitted,
Leonard C. Brecher, Treasurer

Membership Committee

Ralph M. Edeburn, chairman, reported that the names of 155 prospective members enrolled since the 1952 Annual Meeting were posted for the inspection of members and for election by vote at the final business session. On December 31, 1952, the club had 1347 active, 238 sustaining and 82 life members, a total of 1667. Since January 1, 1953, 91 new members have been added. This number will be further increased by the reinstatement of delinquents. The total circulation of the *Bulletin* on December 31, 1952, was 1898; this included 156 institutional subscriptions and 75 exchanges. The membership appears to be in stable condition.

Research Grant Committee

John T. Emlen, Jr., chairman, reported that the year had been a discouraging one for his committee. Only $25 remained in the Louis Agassiz Fuertes Fund, and it was decided that announcements of a grant would not be distributed until such time as

sufficient money was available to make a full award of $100. The President's appeal in the March *Bulletin* for contributions brought forth two responses, but not in time to make a proper announcement for applications, and the award was accordingly deferred for this year.

No candidates were proposed for the S. Morris Pell Award.

It is with great pleasure that we announce a donation of $500 at the Annual Meeting to the Research Committee by an anonymous member of the club. It is most gratifying that this worthy tradition can now be perpetuated, and we sincerely hope that other members in a position to contribute to a research fund will follow this fine example.

Library Committee

George J. Wallace, chairman, reported the major activity of the committee was the publication of the complete book list in the September, 1952, *Bulletin*, which will enable one to see what books or monographs are available, if he wishes to borrow, and what are not available, if he wishes to donate to the library. Accessions to the library since June, 1952, totalled 612 items, consisting of 60 books, 428 reprints, 323 magazines, 99 pamphlets, 1 bulletin, and 1 bird song record. These contributions were made by 79 different donors. The above list substantially exceeds the accessions of any recent year, especially in the number of books. These contributions have been most gratifying.

Illustrations Committee

Robert M. Mengel, chairman, reported that the committee has (1) supervised completely the selection, reproduction, and delivery of the four-color frontispieces in the *Bulletin* and (2) redrawn for authors figures for three articles now in press and has consulted with the editor about numerous other illustrations and illustrations problems.

Temporary Committees

The following temporary committees were appointed:

Auditing Committee: Lawrence H. Walkinshaw, Chairman; John M. McCormick.

Resolutions Committee: Dwain W. Warner, Chairman; Betty Carnes; Harold S. Peters.

Nominating Committee: Maurice G. Brooks, Chairman; Albert F. Ganier; Robert A. McCabe.

Second Business Session

The second and final business session was called to order at 10 a.m., Tuesday, June 16.

The applicants for membership, whose names were posted, were elected to membership to the club.

Report of Auditing Committee

The auditing committee reported that they had examined the books of the treasurer and found them to be correct. They recommended that an accountant be employed to audit the books in the future, prior to the annual meeting date.

Report of the Resolutions Committee

WHEREAS the Wilson Ornithological Club at its Thirty-fourth Annual Meeting has had one of the most successful meetings in the history of the organization, therefore, BE IT RESOLVED that the Wilson Ornithological Club at its Thirty-fourth Annual Meeting, held June 14–17, 1953, at the University of Michigan Biological Station, Douglas Lake, Michigan, express its sincere thanks to those who have made this meeting a most memorable one; to Dr. Harlan Hatcher, President of the University of

Michigan, for making available the facilities of the Biological Station; to Dr. Alfred H. Stockard, Director of the Biological Station, and his staff for their generous and efficient service; to members of the Michigan Audubon Society; and especially to the Local Committee on Arrangements: H. Lewis Batts, Miss Hazel L. Bradley, Edward M. Brigham, Jr., Donald W. Douglass, Miss Irene F. Jorae, Harold F. Mayfield, Mr. and Mrs. Clarence J. Messner, Miss Theodora Nelson, Haven H. Spencer, George J. Wallace, Robert A. Whiting, Harold Wing, and particularly to Olin Sewall Pettingill, Jr., Chairman, and Nicholas L. Cuthbert, Vice-Chairman.

Election of Officers

Maurice G. Brooks, chairman, reported for the Nominating Committee and proposed the following officers for the coming year: President, Walter J. Breckenridge; First Vice President, Burt L. Monroe; Second Vice President, Harold F. Mayfield; Treasurer, Leonard C. Brecher; Secretary, Phillips B. Street; Elective members of the Executive Council, W. W. H. Gunn (term expires 1954), Joseph C. Howell (term expires 1955), and A. W. Schorger (term expires 1956).

The report of the Nominating Committee was accepted, and, there being no nominations from the floor, the secretary was instructed to cast a unanimous ballot for these nominees.

Papers Sessions

Monday, June 15

Theodora Nelson, Hunter College of the City of New York, *A History of Ornithology at the University of Michigan Biological Station*, slides.

C. J. Henry, U. S. Fish and Wildlife Service, *The Seney National Wildlife Refuge*, slides.

Miles D. Pirnie, Michigan State College, *Duck Nesting in Northern Michigan*, slides.

Lawrence H. Walkinshaw, Battle Creek, Michigan, *An Introduction to Some Bird Areas in Northern Michigan*, slides.

George J. Wallace, Michigan State College, *An Introduction to Some Bird Areas in Southern Michigan.*

Edward G. Voss, University of Michigan, *Botanical Features of the Douglas Lake Region*, slides.

S. Charles Kendeigh, University of Illinois, *Niche Requirements of Birds as Illustrated by their Community Distribution in the Douglas Lake Region*, slides.

Gordon Alexander, University of Colorado, *Introgressive Hybridization in Flickers*, slides.

Philip S. Humphrey, University of Michigan, *A Possible Mechanism of Hybridization in Ducks.*

Harrison B. Tordoff, University of Kansas, and J. R. Macdonald, South Dakota School of Mines and Technology, *Evolution in the Cracidae.*

Douglas A. James, University of Illinois, *Aggregatory Roosting Among Certain Passerine Birds: Aspects of the Internal and External Structure*, slides.

Margaret M. Nice, Chicago, Illinois, *The First Week in a Raven's Life.*

Dean Amadon, American Museum of Natural History, *The Helmeted Hornbill; Some Remarkable Adaptations*, slides.

Wesley E. Lanyon, University of Wisconsin, *The Development of Vocal Patterns in a Hand-raised Meadowlark*, tape and slides.

Tuesday, June 16

J. William Hardy, Michigan State College, *Swainson's Warbler: New Records and a History of its Occurrence in Southern Illinois.*

Josselyn Van Tyne, University of Michigan, *The Distribution of Kirtland's Warbler*, slides.

Aretas A. Saunders, Canaan, Connecticut, *Variations in the Song of the Red-eyed Towhee.*

Maurice Broun, Hawk Mountain Sanctuary, *Mid-summer Aggregations of Barn Swallows in Eastern Pennsylvania*, slides.

John T. Emlen, Jr., and Carl Jacoby, University of Wisconsin, *Territory and Survival in a Ring-billed Gull Colony in Mackinac Straits*, slides.

Robert W. Nero, University of Wisconsin, *Sexual Chasing in the Red-winged Blackbird.*

James Bond, Academy of Natural Sciences, *The Rediscovery of the Coré.*

William B. Robertson, University of Illinois, *Breeding-bird Populations in Tropical Florida*, slides.

Donald J. Borror and Carl R. Reese, Ohio State University, *Analytical Studies of Bird Songs* (presented on tape), slides.

Robert C. Stein, Cornell University, *The "Song" Types of the Alder Flycatcher*, tape and slides.

Robert W. Storer, University of Michigan, *A Hybrid Between the Chipping and Clay-colored Sparrows.*

K. T. Rogers, University of Michigan, *The Use of Embryology in Field Ornithology*, slides and motion pictures.

Lawrence I. Grinnell, Ithaca, New York, *Coastal, River and Savannah Birds of British Guiana*, motion pictures.

George E. Grube, Gettysburg College, *The Blue-winged Warbler: its Habitat, Habits and an Incidence of Predation Upon It*, motion pictures.

John M. and Mary R. Jubon, East Millstone, New Jersey, *Glimpses of New Jersey Birds*, motion pictures.

Harold S. Peters, U. S. Fish and Wildlife Service, *Funk Island, Newfoundland, Former Home of the Great Auk*, motion pictures.

Attendance

Members and guests in attendance at the meeting numbered approximately 350, including 41 children. The numbers of children accompanying adults and too young to register are listed in parentheses rather than by name. Twenty-six states, Ontario, Iceland, and Venezuela were represented.

From **Alabama:** 2—*Birmingham*, Mrs. Blanche E. Dean, Blanche H. Chapman.

From **Colorado:** 5—*Boulder*, Mr. and Mrs. Gordon Alexander, Douglas Alexander; *Denver*, Mr. and Mrs. Edwin R. Kalmbach.

From **Connecticut:** 1—*Canaan*, Aretas A. Saunders.

From **Florida:** 2—*Daytona Beach*, Mr. and Mrs. Conrad H. Ekdahl.

From **Georiga:** 1—*Atlanta*, Harold S. Peters.

From **Illinois:** 21—*Blue Island*, Karl E. Bartel, *Champaign*, Douglas A. James, Arthur A. Johnson, Mr. and Mrs. S. Charles Kendeigh (2 ch.), William B. Robertson, Mr. and Mrs. Lyell J. Thomas, *Chicago*, Charles Hartshorne, Alfred Lewy, Constance Nice, L. B. Nice, Margaret M. Nice, Mr. and Mrs. R. M. Strong, *East Moline*, Mr. and Mrs. Elton Fawks, *Murphysboro*, Richard D. Brewer, *Urbana*, Donald C. Goodman.

From **Indiana:** 16—*Connersville*, Edna Banta, *Fort Wayne*, Catherine Pusey, *Hanover*, Mr. and Mrs. J. Dan Webster (2 ch.), *Indianapolis*, Mildred Campbell, Mrs. S. G. Campbell, *Lafayette*, Mr. and Mrs. Albert G. Guy, *New Castle*, Ruby Stockinger,

Richmond, Miss C. E. Anderson, Millard S. Markle, Mary Jane Neal, Mrs. C. S. Snow, Jean Snow.

From **Iowa:** 4—*Cedar Rapids*, Lillian Serbousek, Myra G. Willis, *Davenport*, Mrs. Peter Petersen, Peter C. Petersen, Jr.

From **Kansas:** 13—*Baldwin*, Mr. and Mrs. R. F. Miller, *Lawrence*, Mr. and Mrs. Bert Chewning, Richard W. Fredrickson, Mr. and Mrs. Robert M. Mengel, Mr. and Mrs. Harrison B. Tordoff (3 ch.), *Shawnee*, Ben King.

From **Kentucky:** 6—*Anchorage*, Mr. and Mrs. Burt L. Monroe, *Louisville*, Mr. and Mrs. Leonard C. Brecher, Mr. and Mrs. Frederick W. Stamm.

From **Louisiana:** 1—*Baton Rouge*, Frances Crews.

From **Maryland:** 4—*Hyattsville*, Mary Catherine Crone, Katherine Keeley, *Laurel*, Seth H. Low, *Towson*, Richard D. Cole.

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